SPECIAL BONUS TO ALL NEW

Master Builder

CLUB MEMBERS
PLUS ADDED
BONUSES AND
A NEW
RANKING
See Page
52

Heathkit

Helping you make things better

HERO® 2000

The most advanced automated systems and robotics trainer in the world

NEW

HERO 2000 is a high-technology tool that enables you to explore and learn about controlling real-world automated systems which are intelligent machines. HERO 2000 is also an educational trainer for use in simulating industrial robotic applications. And HERO 2000 is an imagination machine with enormous capability that can stimulate, challenge and inspire the user.

Unmatched technology at

$1999.95

- **A master microprocessor plus eleven other processors that control motors, sensors and interfacing**
- **A multi-jointed, fully articulated arm**
- **A synthesized voice with an unlimited vocabulary**
- **Five different senses; remote wireless control**

HERO 2000 is a highly versatile and powerful automation trainer. Specially designed as an educational tool, HERO 2000 will help you learn about, explore and test the interrelated technologies of robot automation programming, electronics for automation, intelligent machines and robotics. HERO 2000 is also a comprehensive test environment for developing a thorough understanding of basic robotic processes including electricity and electronics, microprocessors and microcomputers, instrumentation and mechanics.

No other educational robot can match the on-board computing power of HERO 2000. The Robot features a 16-bit 8088 master microprocessor that is dedicated to running user programs plus controlling eleven 8-bit peripheral microprocessors. These eleven slave microprocessors perform separate input/output tasks simultaneously thus relieving the main microprocessor from performing the time-consuming task of interfacing to the outside world.

More computing power is contained in 64K of on-board ROM. Stored in ROM is powerful HERO 2000 BASIC that enables easier user programming. More than 20 special robot commands have been added so you can control any additional functions not usually included in standard BASIC. One of these is a direct text-to-speech conversion that allows you to type in what you want the Robot to say in plain text. Also stored in ROM are six robot demonstration routines plus diagnostic, service and sensor adjustment routines.

More computer features include 24K of RAM that can be expanded up to 576K with the addition of three optional memory boards. The Robot also comes equipped with two RS-232 DCE ports configured for a terminal and printer, plus a cassette port for storing your programs on an inexpensive standard tape recorder.

No other educational robot can be expanded or its hardware accessed as easily as HERO 2000. A rear panel card cage swings open for easy access to a tremendous amount of expansion capability; 12 circuit card slots. Five of these slots have openings for back panel connectors. Separate CPU, input/output and motor controller cards use three slots in a minimum Robot configuration. Optional RAM boards can be added to expand memory up to 576K and an Experimenter Board can be installed for conducting experiments or testing your own circuits.

No other educational robot can match HERO 2000's potential for intelligent behavior. Many sophisticated on-board sensors enable HERO 2000 to gather information about its surrounding environment. Then, under your program control, the Robot can alter its behavior in response to changing surrounding conditions to exhibit truly intelligent behavior.

HERO 2000 features an impressive array of senses. A unique scanning sonar system enables the Robot to see objects up to 10 feet away in a complete 360° circle. An auxiliary sonar detector watches for low-lying objects directly in front of the Robot. A light detector uses the same scanning system as the sonar to detect 255 separate levels of light intensity all around HERO 2000. HERO can also hear and measure 255 direct levels of sound 360° around the Robot. This high-tech Robot can also sense the temperatures ranging from 60 to 90 degrees F.

HERO 2000 communicates using an electronically synthesized voice. This system generates 64 sounds that make up human speech to give HERO 2000 an unlimited vocabulary in virtually any language. The voice synthesizer system can also be software controlled through 4096 inflection levels, 16 rate and volume levels, and four full octaves of musical sound. With this capability HERO 2000 can produce a wide range of voices from husky bass to high soprano, including regional accents plus a variety of musical effects and various sound effects.

No other educational trainer can match the robot simulation ability of HERO 2000. The optional arm accessory (standard on an assembled HERO 2000) is a multi-jointed, fully articulated arm with a gripper that has a sense of touch. The Heath Company patented gripper enables the Robot not only to determine the size of a grasped object, but also to adjust the gripping pressure over a nine-level range. The arm has five axis of motion and can manipulate objects up to a pound in weight. DC servo motors are used to provide the arm with speed, power and a high degree of accuracy. A closed loop system is used so HERO always knows the position of the motors and its arm.

No other education robot can match the programmability of HERO 2000. From the top-mounted hexadecimal keypad, you can execute programs from memory or cassette tape and perform diagnostic procedures and tests. You can also maneuver HERO around and select several ROM-stored functions among other commands. Sixteen head-mounted LED status indicators (eight are user definable) show what function HERO 2000 is performing. Next to the keypad is a seven-digit data display that shows addresses and their current data contents.

A hand-held wireless remote control console puts you in complete charge of HERO 2000 from up to 100 feet away. With the optional Remote Console (included with an assembled HERO 2000) you can control in real time or teach HERO complex tasks involving its arm and base using special speed and position keys. The full ASCII typewriter-style keyboard on the console enables you to create, execute or edit a program. Programs are written in HERO BASIC which is permanently stored in ROM. An RS-232C connector on the remote also allows you to connect the remote to the Robot like a terminal. The Remote Accessory features a 2 line by 40 character LCD display and is powered by included rechargeable nickel-cadmium batteries. A 120 VAC charging cube is also included.

No other educational robot has a sophisticated power management system like HERO 2000. A single 24 amp-hour battery provides HERO with up to four full hours of operating power under normal use. Operating time is extended up to six hours when only the electronics are used. This operating time can be further extended by taking advantage of HERO's sleep mode. Using this mode you can power down all HERO's systems except memory and its real-time clock to extend battery life up to six days. An internal warning system alerts the user when the battery reaches a low-charge level. A 120 VAC charger is included.

HERO 2000 is a complete automation learning system that stands 32.4 inches high on a four wheel suspension system. Two side-mounted wheels are servo-motor driven providing a maximum pulling force of 26 pounds. The Robot has eight speeds in both forward and reverse, and it can turn in its own diameter giving the Robot extreme maneuverability. HERO has girth dimensions of 16.5 inches wide by 22.5 inches long. The Robot's torso rotates on its base which gives a sixth axis of motion to an installed arm. HERO 2000 weighs 78 pounds with arm.

And HERO 2000 is fun to build with the experience and promise of "We won't let you fail" from the world leader in robotics education and training. Let HERO 2000 aid you in understanding the nuts, bolts, bits and design concepts of this new microprocessor hardware and software, and industrial electronics technology.

Kit ET-19, HERO 2000, Shpg. wt. 108 lbs. **1999.95**

Kit ETS-19-1, HERO 2000 Arm with Controller Card, Shpg. wt. 14 lbs. .. **699.95**

ET-19-14, Experimenter Board includes two solderless breadboards and bidirectional, buffered interface lines to entire operating system plus regulated power supply outputs, Shpg. wt. 2 lbs. **99.95**

ET-19-51, Demonstration ROM containing eleven entertaining programs illustrating the versatility of HERO 2000's voice synthesizer plus a demonstration of a number of the Robot's sensors. ROM installs in either a socket on the CPU board or a socket on an accessory RAM board. Shpg. wt. 1 lb. **29.95**

Kit ETS-19-35, Remote Keyboard Control operates at 75.43 MHz for 2-way wireless communication with HERO 2000 from up to 100 feet away. Includes rechargeable nickel-cadmium batteries and two frequency modules. Shpg. wt. 5 lbs. **499.95**

Kit ETS-19-36, Remote Keyboard Control operates at 75.67 MHz for 2-way wireless communication with HERO 2000 from up to 100 feet away. Includes rechargeable nickel-cadmium batteries and two frequency modules. Shpg. wt. 5 lbs. **499.95**

ETW-19-15, 192K Static RAM Expansion Board includes 64K RAM that can be expanded up to 192K with the addition of ETA-19-15 RAM Chip Sets. Shpg. wt. 2 lbs. **99.95**

ETA-19-15, 64K RAM Chip Set includes eight 8K x 8 RAM chips for use in expanding the RAM capability of the ETW-19-15 Static RAM Board. Shpg. wt. 1 lb. **49.95**

Kit ETS-19, HERO 2000 Robot with Arm, Shpg. wt. 123 lbs. **2499.95**

EWS-19-35, Assembled HERO 2000 Robot, Arm and Remote control with two 75.43 MHz frequency modules, Shpg. wt. 121 lbs. **4499.95**

EWS-19-36, Assembled HERO 2000 Robot, Arm and Remote Control with two 75.67 MHz frequency modules, Shpg. wt. 121 lbs. **4499.95**

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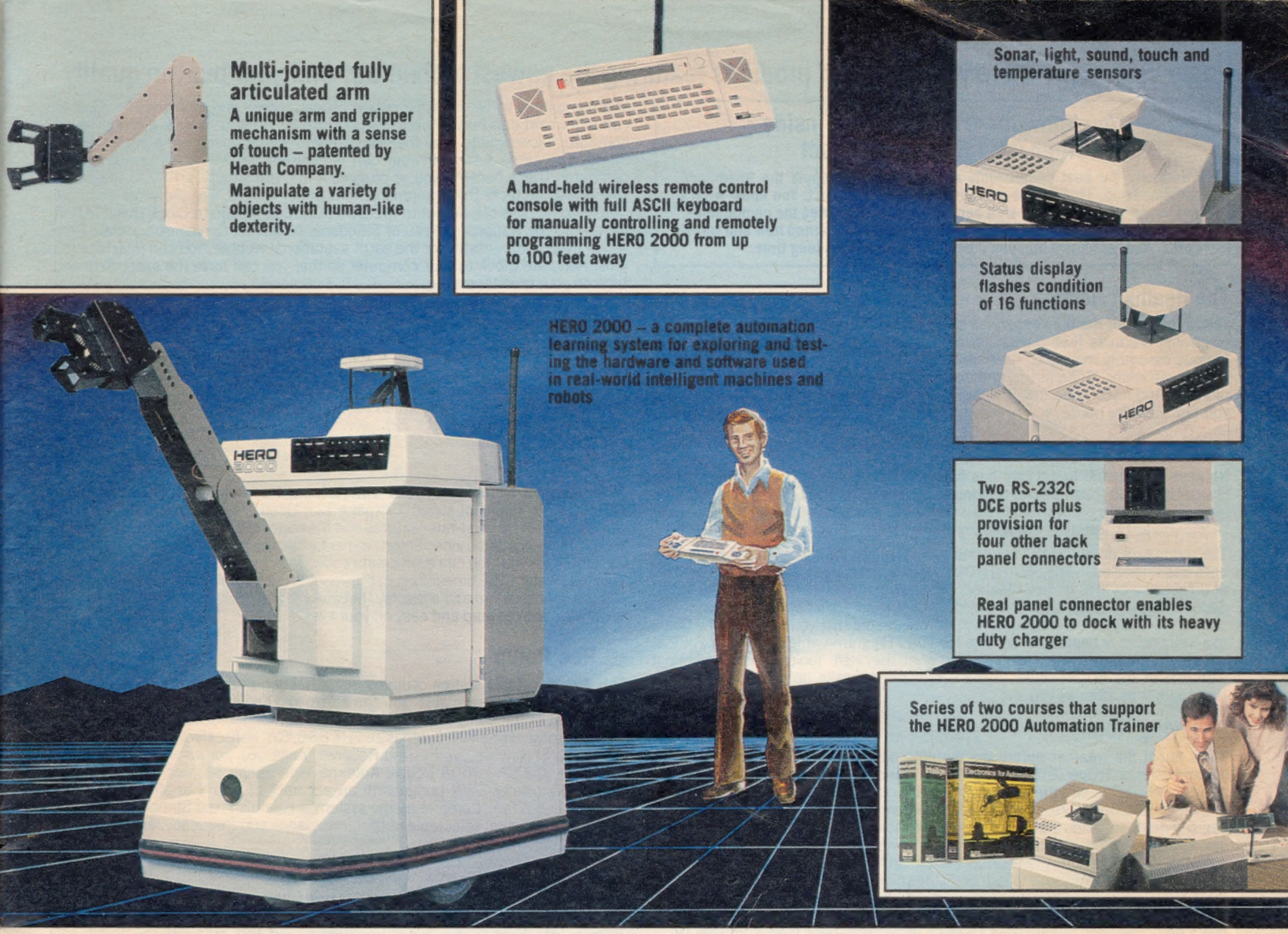
Credit Card Orders Call TOLL-FREE: 800-253-0570. Alaska and Michigan Residents Call: 616-982-3411.


Multi-jointed fully articulated arm
A unique arm and gripper mechanism with a sense of touch – patented by Heath Company.
Manipulate a variety of objects with human-like dexterity.
A hand-held wireless remote control console with full ASCII keyboard for manually controlling and remotely programming HERO 2000 from up to 100 feet away
Sonar, light, sound, touch and temperature sensors
Status display flashes condition of 16 functions
HERO 2000 – a complete automation learning system for exploring and testing the hardware and software used in real-world intelligent machines and robots
Two RS-232C DCE ports plus provision for four other back panel connectors
Real panel connector enables HERO 2000 to dock with its heavy duty charger
Series of two courses that support the HERO 2000 Automation Trainer

Learn about the technical systems that affect all of us in the New Intelligent Machines Course

$99.95

- **Ties together computers, robotics and sensor systems**
- **Written so that even a novice can understand the technical aspects of intelligent machines**

This course is an introduction to intelligent machines. The basic parts of these machines are detailed as well as how they make decisions. Input and output devices are covered including keyboards, mice, digitizers and others. Transducers and sensors are introduced with such complex devices as vision and tactile sensor systems. Concluding the course is a discussion of robotics including characteristics, classifications and programming.

Other subjects covered include basic signal conditioning, analog-to-digital and digital-to-analog conversion, and the hardware and software involved in machine communication. Also touched on are computer aided manufacturing, computer-aided design and flexible manufacturing systems.

To better understand the text material of this course, we recommend the completion of the DC and AC electronics courses on page 65 or equivalent knowledge of the contents of these courses. A knowledge of BASIC is also helpful.

Earn 3.0 Continuing Education Units by passing the optional final exam with a 70% or higher score. Also receive a Certificate of Achievement.

Fifteen interesting experiments transform textbook material into exciting, practical hands-on experience. All the experiments are designed to operate on the HERO 2000 Automation Trainer equipped with its versatile Arm Accessory. No other test equipment is required.

EE-1900, Shpg. wt. 8 lbs. **99.95**

New Automation Course provides a comprehensive look at the electronics used at the component level

$99.95

- **A component by component look at the electronics used in automated industrial robotic systems**
- **Used with the HERO 2000 Automation Trainer to transform textbook theory into exciting, hands-on experience**

A second course in the Heathkit/Zenith series on industrial automation. It presents a sweeping and all-inclusive examination of the electronics used at the component level in automated systems. Covered are industrial controllers and active and passive sensory devices and circuits.

Also covered are signal conditioning circuits including analog sampling and analog-to-digital conversion circuits. Industrial control devices and circuits, motors and digital-to-analog conversion circuits are explained. In addition, actual industrial applications for automated systems are explored including visual and tactile sensing systems.

Thirteen practical and exciting experiments help develop a thorough understanding of the material contained in the text. All experiments are conducted on the unbeatable HERO 2000 Automation Trainer.

Earn 6.0 Continuing Education Units by passing the optional final exam with a 70% or higher score and also receive a Certificate of Achievement.

Completion of the Intelligent Machines Course and the Fundamental Electronic Series which includes the DC Electronics, AC Electronics, Digital Techniques, and Semiconductor courses (pages 65-67) are recommended. A working knowledge of the BASIC Programming Language is also helpful.

EE-1901, Shpg. wt. 11 lbs. (Available in May) **99.95**

Enjoy your home more with Heathkit products featuring the newest technology and your built-in quality

You know there's excellence inside when it's a Heathkit product

We supply the best components and design, you supply the handmade craftsmanship. That's what makes it a Heathkit product. You know what's inside and why it works so well because you've examined the components, built it, and tested it. While you were building it you learned how and why it works. And, you know that you'll be using it for a long, long time.

The Heathkit Home

Take a look at our Heathkit enhanced home across the page, it's full of high quality electronic products that you can build. Kitbuilding is made easy by our world famous assembly manuals. They are written in simple language and are full of large illustrations. Schematics and circuit descriptions help you understand the product. And if you need help give our technical consultants a call – we won't let you fail. Tour our house, you're sure to find just the right product for your home.

1 Entryway

No keys are needed to get into this house. Enter a special code in the Keyless Doorlock keypad (page 6) and the door is unlocked for you. This is great for kids (and adults!) who always forget their keys. You can tell your neighbor the code before you go on vacation – and easily change the code when you return.

The lights turn on automatically when you step into the already cool room. The light was turned on by the SMARTHOME I Controller (page 26) which was notified of your entry by the Infrared Motion Detector/Transmitter from the GDA-2800 Security System (page 26). The SMARTHOME I Controller started the air conditioning 30 minutes before your arrival. It makes sure that you always come home to a well cooled or heated house. The TD-1089 Programmable Doorbell (page 22) will greet your guests with a friendly song when they visit. You can easily program it with one of the 50 melodies in the songbook, or make up your own. You can reprogram it as often as you like.

2 Living Room

Know about the weather before the morning news: the ID-4001 Computerized Weather Station (page 18) gives you all the information you need to plan the day's events and decide whether or not to bundle up. It even calculates the rate of change of barometric pressure and stores past weather data in memory so that you can see weather trends and make your own forecasts. The best part of having your own weather station is that it tells you what the weather is like where you are now – not what it was like at the TV weather station an hour ago. Over against the wall is the Digital Floor Clock (page 20). It adds the splendor of a grandfather clock to the living room, while providing the modern-day digital accuracy you need. Next to the clock, the 45"-diagonal stereo TV (page 12) fits neatly into the room. Even though it is a rear-projection television, it takes no more floor space than a console TV.

The "brain" of the house is the SMARTHOME I Controller (page 26), it runs the house by controlling lighting, appliances, heating, air conditioning, and a variety of electronic devices. You program it with simple to use software and a computer. Then, disconnect it from the computer and let it take over. Plug your appliances into wall socket control modules for control of your lights and appliances. You can even add event-detecting sensors that transmit information to the Controller and the Controller will respond. That's how the lights turned on when we entered the house. The Controller will even start the coffeemaker in the morning and turn off the TV if the kids leave it on. The SMARTHOME I Controller works with the Alarm Center (page 26) to protect the house. When the Controller detects an unusual event it will trigger the Alarm Center, warning you of smoke, unauthorized entry and more. The Alarm sounds up to four different alarms for different emergencies.

3 Kitchen

Even the most complex electronic project is broken down into simple steps in our highly detailed manuals – but, if you're nervous about kitbuilding start out with one of the easy kits displayed here. The Digital Wall Clock (page 20) fits into any area in the house, and the Pleasant Phone Ringer (page 30) will replace that annoying ring with your choice of two tunes or a four-note chime or a beeping signal. There is also a Demon Dialer (page 30) that instantly dials phone numbers for you when you enter a unique letter/number code. It also continues dialing a busy number for up to two hours.

4 Den

Stop dreaming about owning a computer. You can build one. You could be sitting in front of this HS-241 PC-AT Compatible Computer (page 87) running IBM PC-AT and compatible software with increased speed, power and memory. The HS-241 controller card can handle up to two floppy and three hard disk drives. The kit computer allows you to have the newest computer technology at a price you can afford. The entire system in your den is powered up simply by turning on the computer. That's because you've plugged it into the Smart Outlet Box (page 99) which also protects the equipment from power surges. For the most accurate timekeeping possible we put in the GC-1000 Most Accurate Clock (page 20). It locks onto the National Bureau of Standards broadcast to provide accurate time which even compensates for the earth's rotational wobble. You can interface the Most Accurate Clock to your computer so that you can have the exact date and time on your monitor screen.

5 Bathroom

Step into the bathroom and into a world of digital accuracy that removes your doubts about the accuracy of your child's temperature readings, spouse's blood pressure measurements, and your weight. The assurance of electronic precision is invaluable – and inexpensive when you use our digital Thermometer, Blood Pressure Monitor and Scale (page 22).

6 Bedroom

This bedroom becomes a video entertainment center when you turn on the GR-1903 19"-diagonal stereo TV (page 12). Used here as a second TV for the adults, this set has first-rate features and the handcrafted quality of a kit product. Relax and enjoy stereo video entertainment while the remote unit does the work of TV control for you. You can even create coded lock-out of channels to control what your kids watch. The timekeeper in this room is the Digital Alarm Clock (page 20). It has a snooze alarm and a display that automatically adjusts to ambient light so it's always easy to read and easy on your eyes.

7 Rec Room

This Amateur Radio station contains just a fraction of the Heath Amateur Radio equipment which is available. You can set up just about any system you want and build most of the components yourself. This station includes the sophisticated, multi-purpose HW-5400 Synthesized HF SSB/CW Transceiver (page 34) and the SW-7800 Shortwave Synthesized Receiver (page 36). For improved station performance, the SA-2060A Deluxe Antenna Tuner (page 38) was added. It has a built-in wattmeter/SWR bridge with an accuracy of ±5% to eliminate loss of mismatched power. Completing the system is Heath's Fixed Station Microphone (page 40) with dual selectable output impedance and frequency response.

8 Workbench

Testing and kitbuilding are always a pleasure with a well stocked workbench. This basement workbench is full of durable and accurate Heath tools, accessories and instruments. Even the basement becomes a good work area with the bright, cool light provided by the GDP-200 Illuminated Magnifier (page 32). It offers 2 to 1 magnification without distortion. The IO-4225 Dual Trace Oscilloscope (page 44) is a laboratory-grade instrument priced so that hobbyists can have this top troubleshooting and alignment tool at home. The Dual Trace Oscilloscope has a built-in tester and works with the IOA-4200 Time Voltage Module (page 44). For true RMS readings of all AC voltages and currents the IM-2264 (page 46) gives you digital precision. An invaluable aid for troubleshooting, the IT-2232 Component Tracer (page 46) tests unpowered circuit boards and components for quick identification of defective circuit boards.

9 Utility Room

Hidden away in the basement, the Furnace Air Cleaner (page 30) is seldom noticed – but the air it cleans and purifies is appreciated every day. Especially during the "pollen season." The Freezer Alarm (page 26) is another inconspicuous product with an important job. It alerts you of a freezer door left open or of freezer failure – avoiding expensive food loss from spoilage.

10 Garage

Another Heathkit product let's you leave the house as easily as you entered. The GD-3509 Garage Door Opener (page 32) has both a remote control and a wall switch. Once again the way is lit for you – this time by the GD-3509.

More kit products are inside these pages. See many of our new products and beginner kits on pages 4 through 10. Look for these kits and others which will improve your home and lifestyle in this colorful Heathkit catalog. Have the best of both worlds: modern ingenuity and handmade quality with Heathkit products.

VISA MasterCard **Discover the fun of kitbuilding at your Heath/Zenith Computers & Electronics Center.**

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Build one of these easy-to-assemble kits and enjoy the finished product for many years

1 Fisher Technik Robotic Experimenter Kit

$179.95

- **Build and program 10 projects including a plotter, robotic arm and solar cell tracker**
- **Expand your electronics, robotics and programming knowledge with the experimenter**
- **Includes everything you need to interface each project with your personal computer**

Use this one set of components to build 10 useful and entertaining robotic devices. The Robotic Experimenter Kit lets you build intriguing, computer-controlled devices such as a robotic arm which plays "Tower of Hanoi," a materials lift, machine tool, teaching robot, traffic light, plotter, graphic panel, antenna rotor, measuring and sorting system, and computing demo device. Then use the included software and interface to program your computer to control these devices.

GDP-1620-1 for Heath/Zenith PC and IBM compatible computers, Shpg. wt. 3 lbs. **179.95**

GDP-1620-2, for Apple II, II+, IIc computers, Shpg. wt. 3 lbs. **179.95**

GDP-1620-3 for Commodore 64 and VIC 20 computers, Shpg. wt. 3 lbs. **179.95**

2 Rechargeable Portable Light makes it easy to see

$49.95

- **Provides more light over a wider area than conventional, direct beam flashlights**
- **Operates for hours on a charge – recharges overnight on 120 VAC or 12 VDC**

Indoors or out, the Heathkit Rechargeable Portable Light will bathe your work area with a bright, yet soft-on-the-eyes, fluorescent light for a multitude of uses. Helps you see a wider area without sharp, eye-straining shadows. It's safer to use than candles and kerosene lamps in a power outage or while camping. And it saves you money by recharging over and over for just pennies. A "soft start" feature extends tube life. 120 VAC and car lighter socket chargers included. A single charge lasts several hours. Heavy-duty metal case with handle measures 10⅝" H x 3½" W x 5" D. The GD-1246A is designed to survive rugged use – perfect for camping or night work and emergencies.

Kit GD-1246A, Shpg. wt. 6 lbs. **49.95**

3 Electronic Metronome gives you a perfect beat

$29.95

- **Variable between 40 and 210 beats per minute**
- **Reliable performance in cherry-finish birch enclosure**

Whatever instrument you play, the Heathkit Electronic Metronome will maintain a steady beat so you can practice confidently at the correct tempo. A sound board and solenoid produce an authentic metronome sound.

Front panel control lets you set the tempo you need. A rear panel control lets you adjust the volume from soft to a loud, conventional "tick-tock" rhythm. Includes a handy label so a student can relate the number of beats per minute to tempos in different time signatures.

Kit TD-1257, Shpg. wt. 2 lbs. **29.95**

4 Multi-purpose AA-18 Solid-State Mono Amplifier

3.25 WATTS, MINIMUM RMS, INTO 8 OHMS WITH LESS THAN 1.5% TOTAL HARMONIC DISTORTION FROM 40-20,000 HZ

$44.95

This solid-state kit takes a minimum 250 mV signal from a source (ceramic phono cartridge, monophonic AM or FM receiver, tape player, TV, etc.) and cleanly amplifies it. Drives 8-ohm speakers to surprising sound levels – also can be used as a headphone amplifier. The AA-18 Mono Amplifier is an ideal beginner kit that goes together in just one evening.

The AA-18 Mono Amplifier features rear panel speaker terminals and an input jack. Located on the front panel are a headphone jack, power switch with 'on' lamp, and volume and tone controls. The all-metal housing has dimensions of 2⅝" H x 7¾" W x 5½" D. It is fuse protected and operates on 120/240 VAC, 50/60 Hz at 5 watts maximum.

Kit AA-18, Shpg. wt. 4 lbs. **44.95**

5 This AM Portable Radio is an easy kit to build

$19.95

- **Designed for the first-time kit builder**
- **Optimum AM reception, almost anywhere**
- **Improved circuitry for extended battery life**

A perfect kit that will thrill any youngster! Excellent AM sensitivity gives sensational reproduction of voice and music with a clear, even tone. Take this great little performer with you anywhere for extra fun. High-gain ferrite rod antenna delivers long-distance reception. Uses 9V battery (not included) or PS-2350 Battery Eliminator on page 48. Includes earphone for private listening.

Kit GR-1009, Shpg. wt. 2 lbs. **19.95**

6 Heath's Ultrasonic Cleaner for delicate items

$99.95

- **For those almost-impossible special cleaning chores**
- **Cleans and sanitizes most precious items that might be damaged by abrasive scrubbing or harsh cleansers**

This scientific method is the fastest, most effective way to clean dirt, stains and undissolved solids from hard-to-clean jewelry, watch parts, glass, coins, components, dentures, paint brushes, etc. Cleaned objects sparkle like new! All delicate items, except pearls and turquoise, are safely cleaned without abrasion.

The GD-1151 Ultrasonic Cleaner is efficient, with a maximum power consumption of only 100 watts. Use a standard laundry detergent or softener at any temperature between 32° and 122°F. Filling the 6" L x 4" W x 2⅜" D tank with one inch of cleaning solution only requires about 1¾ cups.

Professional artisans, jewelers and watchmakers have used the ultrasonic method for years. This low-cost kit is easy to build, in two evenings – and it lets you take advantage of this safe and efficient cleaning process. Operates on 120 VAC.

Kit GD-1151, Shpg. wt. 5 lbs. **99.95**

7 Photoelectric Light Switch to protect your home

Great low-cost insurance against break-ins: Turns lights on in the evening, off at dawn – automatically. Gives your home a "lived-in" look to discourage unauthorized entry while you're away. Plug it into any outlet, adjust sensitivity and it controls lamps or other AC-operated devices up to 150 watts. This practical and beneficial security kit measures 3½" H x 2⅝" W.

Kit GD-600, Shpg. wt. 2 lbs. **9.95**

8 Photobeam Alarm Relay detects intruders

This useful and affordable system can serve many purposes. Use it to detect intruders and activate lights or any 120 VAC warning device up to 300 watts total. Or use it to automatically turn on a light in a hall that has the switch on the far end. Capable of many useful functions in your home, the GD-1021 consists of a mirror assembly and light source/photocell relay. It is sensitive to its own light source up to 25 feet away from its reflecting mirror. The electronics package measures 5⅜" H x 4⅜" W x 5¼" D.

Kit GD-1021, Shpg. wt. 3 lbs. **19.95**

9 Inexpensive, easy-to-build Freezer Alarm

Protect your meats and other frozen foods from spoilage by an instant alarm that warns of a failure in your freezer's cooling system or a door left ajar. Two-speed alarm beeps and red LED flashes at a slow rate if inside temperature rises above +20°F; faster if door stays open too long. Requires 2 "C" batteries (not supplied). Slide switch shuts off alarm. Includes 20' of thin hook-up wire, plus mechanical, temperature and water sensors – with application ideas.

Kit GD-1183, Shpg. wt. 2 lbs. **19.95**

10 Flood Alarm detects water, sounds loud warning

Avoid expensive, messy water hazards in your home, basement, RV, factory, garage – anywhere excess moisture threatens! The Flood Alarm detects water when it first appears, giving you time for corrective action before it does major damage. Sensor sticks anywhere. When water touches it the Alarm produces a loud beeping in time with a flashing red LED to get fast attention!

Kit GD-1701, Shpg. wt. 2 lbs. **24.95**

VISA MasterCard **Credit Card Orders Call TOLL-FREE: 800-253-0570. Alaska and Michigan Residents Call: 616-982-3411.**

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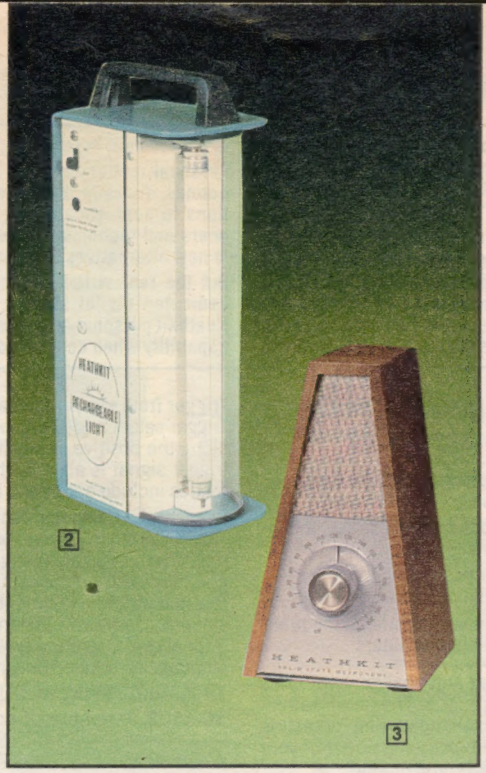

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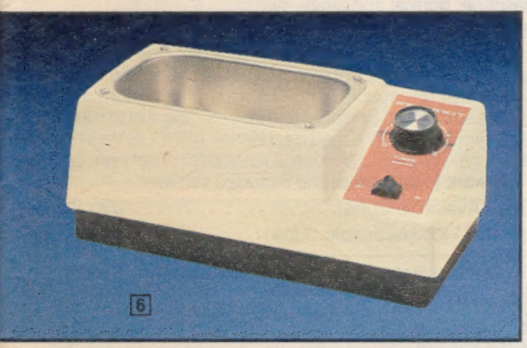

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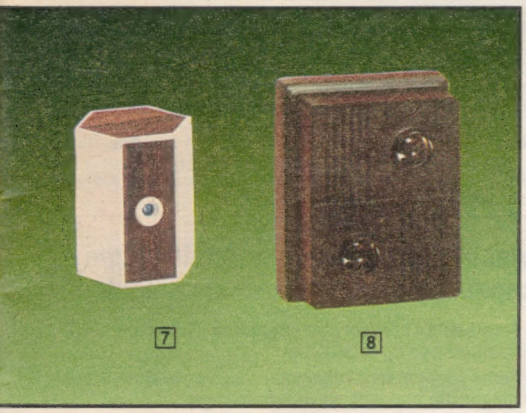

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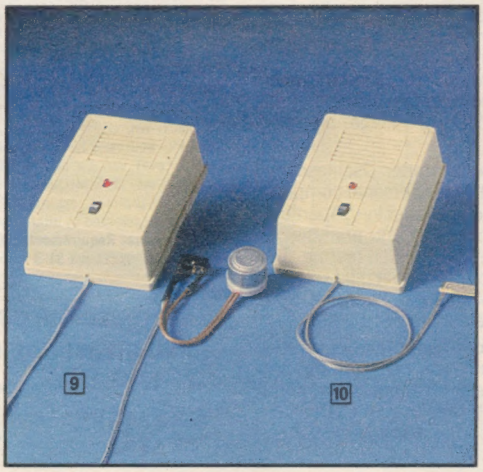

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11 Battery Life Tester saves on replacements

Test all popular-size batteries and stop waste – be certain a battery is dead before you throw it away. Does more than just have a "good-?-bad" reading – actually indicates *how much useful life* remains on a 0-to-5 meter scale. Tests alkaline or carbon-zinc 9V or 1.5V AA, C & D-size batteries, plus 1.2V rechargeables. Indispensible for households with many independently powered items – radios, cameras, toys, smoke alarms, flashlights. Test eyelet snugs into front slot.

Kit GD-1703, Shpg. wt. 1 lb. **16.95**

12 Low cost and highly sensitive radiation monitor

This precision shirt pocket-sized instrument is ideal for many industrial, medical, educational and commercial applications – even for use around the house. It provides broad spectrum detection of Alpha, Beta, Gamma and X-rays. A flashing count light and beeper indicate detected radiation. Radiation levels are displayed on a large meter and measured on three selectable ranges from 0 to 50 milliRoentgens per hour (mR/h). Calibration is traceable to the National Bureau of Standards Cesium 137 Gamma source ($35.00 for certified calibration service, refer to manual). Uses sensitive, industry standard Geiger-Mueller tube. Includes a 9 VDC battery. 5.7" H x 2.8" W x 1.5" D.

Kit RM-4, Shpg. wt. 2 lbs. **149.95**

The Heathkit® Pledge

Our instruction manuals are written with you, the builder, in mind. They begin with an introduction to the product and a soldering guide for the first-time builder. Step-by-step instructions and clearly-detailed illustrations take you through every phase of construction. In case of difficulty, there's a troubleshooting guide. You can even call or write the Heath Technical Consultants for prompt, courteous answers to any special questions. You can't go wrong, because our ever-growing popularity around the world is based on this one simple pledge:

"We won't let you fail!"

Heath Company introduces the next step in the evolution of test instruments

New, powerful diagnostic tools are emerging from the field of instrumentation. These tools combine the features of traditional test instruments with the advantages of a personal computer into a single multifunction instrument. Tools with these capabilities are appearing under the label of "personal instruments."

In broad terms, personal instrumentation consists of a combination of hardware and software that is integrated with a personal computer to produce a test instrument or a function of an instrument. For example, combining the display and control features of several instruments with the storage and processing power of a personal computer results in an instrument that can perform tests, display and record measurements, and even analyze the results. This matchup is hard to beat in terms of convenience, versatility and cost.

Personal instrumentation is only in its infancy but is growing by leaps and bounds. Already this field has progressed from basic measurement functions to sophisticated signal analysis, logic analysis and emulation. Engineers and technicians have found that personal instruments open up entirely new alternatives to measurement and data acquisition.

But the real virtue of personal instrumentation is its cost-effectiveness. A dedicated digital storage oscilloscope can cost as much as $5,000. The Heathkit personal instrument version is in the $400 range and offers the same capability when connected to your computer.

1 Turn your personal computer into a powerful and versatile dual trace 50 MHz digital storage scope

Advanced instrument technology at only

$399.95

- **Easily store monitored waveforms and save them indefinitely for later analysis**
- **Recall stored information to the screen so that it can be compared with real-time signals**
- **Have full control of all oscilloscope functions from the keyboard of your personal computer**
- **Use with Heath/Zenith Personal Computers, the IBM PC or other IBM PC-compatible computers**

Connect this simple interface to your personal computer and analyze waveforms like you've never been able to do before with an analog scope. The new Heathkit Computer Oscilloscope operates just like the scope you are now using for testing and troubleshooting. Except now you can apply all the processing power of your personal computer to waveforms displayed on its monochrome monitor.

All functions are controlled from the keyboard of your computer. At your fingertips you have the normal waveform control of a scope, vertical sensitivity, horizontal time base, trigger selection, and the others with which you are so familiar. Plus, with the Computer Oscilloscope and the included software, you can store waveforms indefinitely on a floppy disk. At the touch of a key you can also eliminate noise on a signal by averaging, and get automatic readouts of voltage, time and frequency at any point on the waveform.

Make remote, unattended checks of circuits with the Computer Oscilloscope. Standard RS-232 cabling interconnects this interface to your personal computer for minimal cabling costs. Set up a remote equipment signal checking operation where signals can be monitored and stored for later checking and analysis. Or customize the software for a specific application such as automated testing. The included Operation Manual contains program descriptions for easier user software modification. With a modem or a series of modems, you can even set up a monitoring system made up of many devices linked to a central computer.

Make hard copies of all screen displays for your records. With the print utilities contained within the operating system of your computer you can print out and save any screen display. Save displays for later reference or file them as part of the preventive maintenance record of electronic equipment. Displayed on-screen are the waveform, all scope function settings used to obtain the display, and voltage and frequency information.

On-screen information includes a display of either one or two channels on a graphic 8 x 10 division graticule. Two cursors, independently controlled, can be placed anywhere on either trace. The CRT screen displays the voltage at the cursor position and the time difference between the cursor and the beginning of the trace for each cursor. Also displayed are the voltage difference between the two cursor positions and the time difference, and the equivalent frequency between them. On-screen menus show all scope function selections.

A sampling interface, the Computer Oscilloscope periodically samples one or both of the analog input signals and converts them into digital code. These converted signals are then stored in memory where they can later be retrieved for displaying on the monitor of your personal computer. The Computer Oscilloscope samples repetitive waveforms from 0.4 seconds/sample to 200 picoseconds/sample. Nonrepetitive waveforms are sampled from 0.4 seconds/sample to 10 microseconds/sample.

This laboratory-grade instrument features a ten step 5 mV/division to 5V/division vertical sensitivity in a 1-2-5 sequence with an accuracy of 3% ±2 bits. Both vertical inputs are rated at 125 volts maximum (peak + DC) and either channel can be inverted. The Computer Oscilloscope has three display modes: Y1, Y2 and DUAL. All displays are chopped except for the 500 μs/div range which uses an alternate sweep display. The time base ranges from 20 s/division to 10 ns/division in 29 steps in a 1-2-5 sequence with an accuracy within 3% ±2 bits.

Trigger from either channel to get rock stable displays of virtually any waveform. Trigger select and level controls allow the time base to be triggered at any point along the positive or negative slope of either the Y1 or Y2 trigger signal. When a trigger signal is absent, the monitor displays a trigger absent message. Trigger modes include automatic baseline, normal and single sweep.

Connect the Computer Oscilloscope to an IBM PC-compatible computer, like the Heath/Zenith PC series, equipped with at least 128K RAM and one 5.25" floppy disk drive. If you are using an IBM PC or compatible computer you'll need a color graphics card and the computer must be capable of RS-232 communications. All this is standard equipment on Heath/Zenith Personal Computers. You'll also need a null-modem cable like the HCA-52 cable on page 101. Use the MS-DOS Version 2 (or above) operating system. The GW-BASIC Version 2 (or above) programming language is required only if you want to customize the included software.

Kit IC-4802, Shpg. wt. 10 lbs. (Available June)..... **399.95**

SC-4802, Assembled, Shpg. wt. 11 lbs.(Available June)..... **575.00**

IC/SC-4802 SPECIFICATIONS: VERTICAL: Display Modes: Y1, Y2, Dual. (All displays except 500 μs/div are chopped. 500 μs/div uses an alternate display.) **Deflection Sensitivity:** 5 mV/div to 5 V/div. 10 steps in a 1-2-5 sequence. **Deflection Accuracy:** Within 3% ±2 bits (20°C to 30°C); 5% ±2 bits (10°C to 40°C), referenced to 20 mV/div. **DC Coupling Frequency Response:** DC to 50 MHz −3db. **AC Coupling Frequency Response:** 10 Hz to 50 MHz −3db. **Rise Time:** 7 ns or less. **Overshoot:** Less than 5%. **Vertical Input Impedance:** 1 MΩ shunted by 40 pF. **Maximum Vertical Input:** 125 volts peak combined AC and DC. **HORIZONTAL: Time Base Range:** 20 s/div to 500 μs/div in a 1-2-5 sequence, Real Time Sampling. 200 μs/div to 10 ns/div, Equivalent Time Sampling. **Maximum Real Time Sampling Rate:** 100 kHz. **Time Base Accuracy:** Within 3% ±2 bits (20°C to 30°C); 5% ±2 bits (10°C to 40°C), referenced to 1 ms/div. **TRIGGER: Source:** Y1, Y2. **Coupling:** Same as vertical. **Modes:** Automatic baseline, Normal, Single Sweep. **Level:** Variable over at least eight divisions; 256 steps. **Sensitivity/Bandwidth:** DC: 1.0 div, >60 MHz; 1.5 div, >90 MHz. AC: 1.0 div, 6 Hz to 60 MHz. 1.5 div, 2 Hz to 90 MHz. **GENERAL: Vertical Resolution:** 8 bits (1 part in 256). **Record Length:** 512 Samples. **Interface:** RS-232C. **Baud Rate:** 110 to 9600 baud (selected by internal jumper). **Power Supplies:** Fully regulated. **Operating Temperature:** 10°C to 40°C. **Power Requirements:** 108 to 132 VAC, 60 Hz, 48 watts (at 120 VAC). **Dimensions:** 4½" H x 12½" L x 10" W (11.4 x 31.3 x 25 cm). **Weight:** 8 lbs. (3.6 kg).

2 Increase the power of a low frequency oscilloscope or add measuring capability to your personal computer

$499.95

Kit

- **A versatile accessory for upgrading a low-bandwidth oscilloscope up to 50 MHz**
- **Turns your personal computer into a powerful diagnostic tool with waveform storage**
- **Use with 5 MHz or above scopes, or Heath/Zenith PCs, the IBM PC or other IBM PC-compatibles**

The Heathkit Digital Memory Oscilloscope is a sophisticated interface that lets you harness the power of the personal computer with the capabilities of the IC-4802 Computer Oscilloscope (see preceding product description). Plus it can also give a low-frequency bandwidth scope new power by upgrading it into a versatile 50 MHz digital storage oscilloscope.

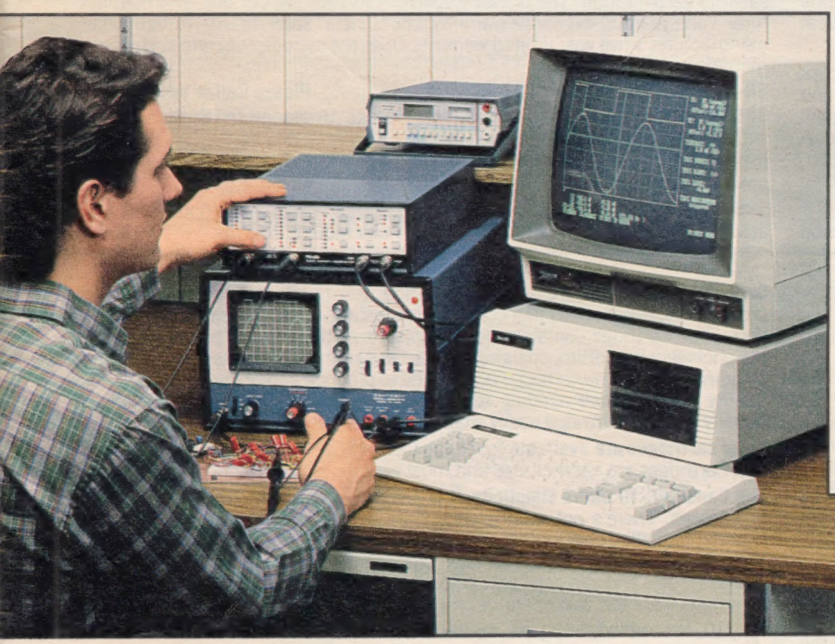
When used with a personal computer you gain full control of the Digital Memory Oscilloscope from the computer keyboard with a waveform display on the computer's monitor. You get the tremendous asset of waveform storage, voltage and frequency displays at any point on the waveform, and the capability to set up a test and analysis workstation for your own specific purpose. Used with an oscilloscope, all operations are controlled from the front panel of the Digital Memory Oscilloscope and waveforms are displayed on the CRT of the scope being upgraded. Or connect this amazing device to both a personal computer and an oscilloscope at the same time. Use them interactively and extract test information you never thought possible from electronic circuits.

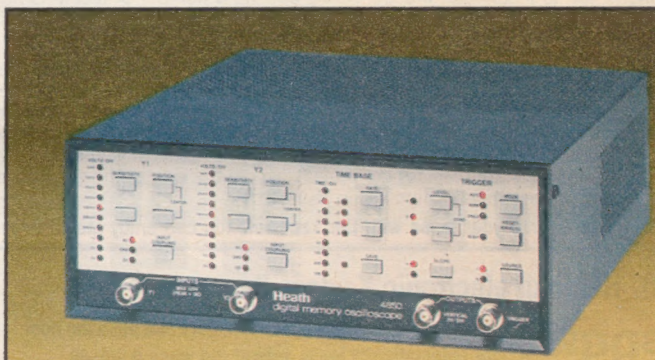
Eliminate the expense of costly equipment and realize the savings by connecting the Digital Memory Oscilloscope to a personal computer. Besides using a PC for engineering programs, word processing and other business applications, enjoy

Use your Visa or MasterCard credit card to purchase your kit!

1 **The Computer Oscilloscope provides a personal computer with the ability to perform just like a dual trace 50 MHz digital storage oscilloscope**

NEW





2 **The Digital Memory Oscilloscope increases the power of both oscilloscopes and personal computers**

NEW

accurate testing and waveform analysis. Or, easily upgrade test equipment within the limits of tight budgets. Get increased scope capability and have the equivalent of highly technical troubleshooting equipment that's both easy to operate and inexpensive to own. Or, do both with the same simple interface.

To add measurement capability to a personal computer, you'll need an IBM PC-compatible computer, like the Heath/Zenith PC series, equipped with at least 128K RAM and one 5.25" floppy disk drive. If you are using an IBM PC or compatible computer you'll need a color graphics card and the computer must be capable of RS-232 communications. All this is standard equipment on Heath/Zenith Personal Computers. You'll also need a null-modem cable like the HCA-52 cable on page 101. Use the MS-DOS Version 2 (or above) operating system with the included floppy disk. The GW-BASIC Version 2 (or above) programming language is required for customizing the included software for specialized applications such as automated assembly line testing.

To increase the capability of your oscilloscope, the scope must have a 5 MHz or greater bandwidth, one vertical channel with 0.5 V/division sensitivity, ability to trigger from a second source, and triggered sweep (on the plus slope of a TTL level signal). Two BNC to BNC coaxial cables are also needed.

Kit ID-4850, Shpg. wt. 11 lbs. (Available June)..... **499.95**

SD-4850, Assembled, Shpg. wt. 11 lbs. (Available June) **750.00**

ID/SC-4850 SPECIFICATIONS: VERTICAL: Display Modes: Y1, Y2, Dual. (All displays except 500 µs/div are chopped. 500 µs/div uses an alternate display.) **Deflection Sensitivity:** 5 mV/div to 5 V/div. 10 steps in a 1-2-5 sequence. **Deflection Accuracy:** Within 3% ±2 bits (20°C to 30°C); 5% ± 2 bits (10°C to 40°C), referenced to 20 mV/div. **DC Coupling Frequency Response:** DC to 50 MHz −3db. **AC Coupling Frequency Response:** 10 Hz to 50 MHz −3db. **Rise Time:** 7 ns or less. **Overshoot:** Less than 5%. **Vertical Input Impedance:** 1 MΩ shunted by 40 pF. **Maximum Vertical Input;** 125 volts peak combined AC and DC. **HORIZONTAL: Time Base Range:** 20 s/div to 500 µs/div in a 1-2-5 sequence, Real Time Sampling. 200 µs/div to 10 ns/div, Equivalent Time Sampling. **Maximum Real Time Sampling Rate:** 100 kHz. **Time Base Accuracy:** Within 3% ±2 bits (20°C to 30°C); 5% ±2 bits (10°C to 40°C), referenced to 1 ms/div. **TRIGGER: Source:** Y1, Y2. **Coupling:** Same as vertical. **Modes:** Automatic baseline, Normal, Single Sweep. **Level:** Variable over at least eight divisions; 256 steps. **Sensitivity/Bandwidth:** DC: 1.0 div, >60 MHz; 1.5 div, >90 MHz. AC: 1.0 div, 6 Hz to 60 MHz. 1.5 div, 2 Hz to 90 MHz. **OSCILLOSCOPE OUTPUT: Vertical:** 4 volts peak-to-peak (oscilloscope setting is 0.5 V/div vertical, 1 ms/div horizontal). **Trigger:** TTL level. **GENERAL: Vertical Resolution:** 8 bits (1 part in 256). **Record Length:** 512 samples. **Interface:** RS-232C. **Baud Rate:** 110 to 9600 baud (selected by internal jumper). **Power Supplies:** Fully regulated. **Operating Temperature:** 10°C to 40°C. **Power Requirements:** 108 to 132 VAC, 60 Hz, 48 watts (at 120 VAC). **Dimensions:** 4½" H x 12½" L x 10" W (11.4 x 31.3 x 25 cm). **Weight:** 8 lbs. (3.6 kg).

See our entire selection of versatile, laboratory-grade test and troubleshooting instruments on pages 44 through 55.

Tune in to dynamic satellite TV using this top-notch satellite television system

NEW

$1495.00

- **Black mesh Dish Antenna blends into any landscape**
- **Attractive stereo Receiver fits right in with your audio/video components and has audio/video outputs**
- **Wireless Remote gives you complete control from your easy chair**
- **Enjoy stereo with the built-in stereo decoder**
- **Easy installation saves you costly installation fees**

A technologically advanced yet low-cost satellite television system: Heath Company evaluated many satellite TV components before selecting the General Satellite Dish Antenna and the Norsat Receiver to give you the best system possible. The Receiver was chosen as "one of the most innovative consumer products in 1985" at the 1985 Consumer Electronics Show. The Antenna's five year limited warranty attests to its durability and performance.

Made of lightweight, heat-treated aircraft-type aluminum and topped with a hard, durable powder-coat paint finish, the Antenna gives you years of maintenance free service. The Dish is easy to set up and features a sturdy supporting rib design to better withstand the elements. The Dish Antenna comes with button-hook assembly and Polar Mount. It may be positioned either mechanically with the hand crank or electronically with the Antenna Positioner and Actuator. The Dish Antenna is available in standard 8-foot diameter size or in ten-foot diameter size for use in locations on the fringe of satellite coverage areas.

An 85 degree low noise block down converter (LNB) boosts the satellite signal while minimizing noise to give you a strong, clear picture. The LNB converter allows you to install and independently operate a number of receivers off one antenna. High efficiency feed allows automatic selection of horizontal and vertical polarities.

The microprocessor-controlled Receiver is superbly designed for quality reception of satellite relayed programming. The attractive unit is easy to operate and features stable 24-channel quartz-synthesized tuning. The channel you want will always be there at the touch of a button because annoying drift is eliminated. A Scan feature helps you locate various satellites when changing antenna position. The Antenna Control provides convenient remote tracking of the satellite arc so you can change satellites from inside your home.

Bring stereo into your home with this receiver. You can enjoy stereo television entertainment on your television or by using your hifi system with the Receiver. Separate audio frequency selection lets you receive program and auxiliary audio services, including stereo which is offered on some channels. The Audio Select Button allows selection of the 6.2 MHz Preset (Occasional TV audio), 6.8 MHz Preset (Normal TV audio) or VAR A:B (Owner's selection of subcarriers). In the VAR A:B Mode you can choose Matrix or Direct stereo, and Wide or Narrow mono. Pushbutton audio tuning controls tune the left and right channels in the stereo mode. The Receiver also features pushbutton channel selector, audio mute, separate audio/video outputs and LED display of functions. Built-in East/West antenna control buttons move the antenna to tune in different satellites. Skew allows manual fine tuning of the satellite dish polarization. The back panel has a plug for your descrambler. The Receiver automatically switches from your TV antenna to the Dish Antenna when you turn it on.

Control it all from your easy chair with the infrared Remote Control Unit. You can select channels directly by entering the channel number with the pushbutton keypad. Touch a button to change from one satellite to another with the Antenna Positioner and Actuator. If not using the Positioner and Actuator, the satellite station may be changed by manually moving the reflector with the hand crank. The Remote Control also operates the Receiver's audio preset, stereo presets and audio mute.

Save installation charges by installing it yourself. The system is easy to install with our Heathkit manual which explains every step through clearly written instructions and large, labeled illustrations. Call or write to order a Site Survey Kit or pick one up from your local Heath/Zenith Computers & Electronics Center before ordering a satellite system. It helps you determine if your site is acceptable for a satellite earth station. The Norsat Receiver and LNB are covered by a manufacturer's one year full-exchange warranty. The General Satellite Dish Antenna has a manufacturer's five year limited warranty. Does not include concrete and antenna mounting post.

SR-8300-10, Site Survey Kit, 1 lb. ..... Please Call or Write to Order

SRS-8300, Assembled Receiver, Remote Control. Unassembled 8' Dish Antenna with Polar Mount and Hand Crank, 244 lbs. **1495.00**

SRS-8301, Assembled Receiver, Remote Control, Antenna Positioner and Actuator. Unassembled 8' Dish Antenna with Polar Mount, 264 lbs. **1795.00**

SRS-8302, Assembled Receiver, Remote Control, Antenna Positioner and Actuator. Unassembled 10' Dish Antenna with Polar Mount, 288 lbs. **1995.00**

1 Heathkit electronic Keyless Doorlock

$99.95

- **Simply enter four preselected numbers and push the door**
- **Door automatically locks behind you when it closes**
- **Replaces door frame strike plate; keep your lock and key**

Free yourself from carrying cumbersome keys as you go jogging or work in the back yard. The GD-3830 Keyless Doorlock lets you back in the house just by entering a simple four digit number of your choice. You need never again send a house key to school with your child or stay up late waiting for someone who has forgotten a house key. Give the number code to your neighbor while you're on vacation and easily change it when you return. With 11,880 possible number combinations, the code sequence can be changed as often as desired.

This innovative door lock system works with all conventional residential locks (except deadbolt locks). A keypad mounts outside near the door knob and a solenoid-operated strike mechanism replaces your present strike-plate. You program the four-digit code, the amount of time to enter the correct code, and the time (adjustable up to 45 seconds) the door remains unlocked after opening.

In case of a power loss, your key works as it always did, or connect a +12 VDC backup battery (not included) for operation under all conditions. The Keyless Doorlock operates on 120 VAC using an included power cube or, optionally, from a +12 VDC source. Keypad, 4.5" H x 2.7" W x 1.5" D. Control module, 4.4" H x 3" W x 1.3" D. Stroke mechanism, 5.7" H x 1.3" W x 1.3" D. Professional installation may be needed on metal frame door jams.

Kit GD-3830, Shpg. wt. 5 lbs. **99.95**

2 Canon Personal Copiers copy in color on plain paper

- **Unique interchangeable cartridge system enables virtual service-free copier operation and eliminates messy toner refilling**

Canon's Personal Copiers make it easy to produce excellent and inexpensive copies on plain paper with a minimum of effort. No longer need you run down the street to the local print shop or library to find a copier, which can be time consuming and expensive. Instead, Canon makes it possible even for an individual to own a copier that fulfills the needs of the small, as well as the large business.

Canon's unique cartridge system allows the user to regularly change the major problem-causing devices in a copier which results in virtually service-free operation. Each cartridge contains the components of the copying process including the photosensitive drum, charging device, development and toner assembly, and a cleaning system. The cartridge is designed to produce approximately 2,000 high-quality copies before needing replacement, making the cost per copy exceptionally low. The cartridge easily snaps in and out for no-mess replacing.

Color cartridges are available for all the Canon PCs. Choose from black, brown or red. Cartridges are not included and must be ordered separately.

The Canon PC-10 offers simplicity. It is just the right machine for home or small businesses. There's not even a copy start switch to operate. Just feed in tax records, cancelled checks, ledgers, statements, to name only a few uses, and get a sharp, clear copy. The PC-10 can also produce two-sided copies, transparencies, address labels and can copy onto colored paper. Measures 16⅛" W x 18⅜" D x 7" H, weighs 43.7 lbs. and operates on 110 VAC, 60 Hz at 1.15 kW (max.).

PP-710, Assembled, Shpg. wt. 48 lbs. **695.00**

The Canon PC-14 makes up to eight beautiful copies a minute and can make from 1 to 19 copies automatically. A unique, automatic stack-sheet feeding system allows you to make multiple copies on any size paper from business card to letter. This copier uses 110 VAC at 60 Hz, 1.39 kW (max.). It has dimensions of 17⅜" W x 19⅛" D x 7" H and weighs 41.2 lbs.

PP-714, Assembled, Shpg. wt. 49 lbs. **895.00**

The Canon PC-25 offers large-copier features with Personal Copier convenience and low price. It is suitable for almost any copying task. Besides the usual 1:1 copying the PC-25 can reduce by 67% or 78% and enlarge to 120% of normal size. It features the convenience of automatic feeding, 1 to 19 multiple copies, and it even copies up to legal size from originals as big as 10 x 14. The PC-25 has dimensions of 18⅞" W x 19⅜" D x 11½" H and weighs 55 lbs. This desktop copier operates on 110 VAC, 60 Hz and uses a maximum of 1.35 kW.

PP-725, Assembled, Shpg. wt. 72 lbs. **1195.00**

Easy-to-replace color cartridges for Canon copiers:

PPA-710-1, Canon PC black cartridge, Shpg. wt. 5 lbs. **64.95**

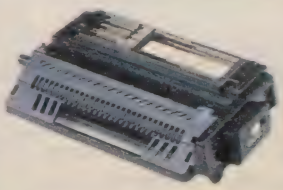
PPA-710-2, Canon PC brown cartridge, Shpg. wt. 6 lbs. **79.95**

PPA-710-3, Canon PC red cartridge, Shpg. wt. 6 lbs. **79.95**

VISA MasterCard **Credit Card Orders Call TOLL-FREE: 800-253-0570. Alaska and Michigan Residents Call 616-982-3411.**

1

2 Three Canon Personal Copiers to satisfy a variety of needs



Canon's unique PC cartridge

At the heart of each Canon PC is a disposable cartridge that contains everything relating to the copiers development process

Enjoy superior video and audio entertainment at home with these innovative stereo TVs

[1] 27"-diagonal stereo TV kit has extra 25" of picture for your viewing pleasure

$749.95

- **Built-in stereo decoder, stereo control center and sound system with stereo power amplifier**
- **Flashback button lets you alternate between your two favorite channels at the touch of a button**
- **Includes Computer Space Command Remote Control**
- **Video jacks provide monitor input**
- **16 hour kit – all but one circuit board preassembled**

The latest television technology is affordable when you're considering the GR-2700. Stereo sound surrounds a 325-line-resolution 27"-diagonal picture. You control both picture and stereo completely with the Computer Space Command Remote Control as well as with the sophisticated control console hidden inside a drawer on the set. You also have control over channels you don't want your children to watch. Only you may access these channels with the special code you have programmed in – even unplugging the set won't disturb your privacy setting. Cable-ready and with direct audio/video capabilities, this television gives you the latest features you've been hearing about – plus the dependable quality of the Advanced System 3 television.

The unique 27"-diagonal flat, square picture has 25 square inches more picture area than a 25" TV. Dark glass absorbs ambient light to provide a picture with exceptional contrast and color fidelity. A black matrix surrounds each phosphor element with black to produce deep, rich colors. The color picture is automatically corrected 30 times a second by the Advanced Color Sentry so you always have life-like flesh-tones, and accurate color and contrast. Automatic CRT tracking ensures that colors remain vivid and true year after year. You get an incredibly sharp, realistic picture with the Advanced System 3's Chromacolor Contrast picture tube and peak resolution picture circuit which provides up to 25% greater resolution than many other sets.

The built-in stereo audio system includes a stereo decoder which processes stereo telecasts, simultaneously telecast second audio programs or mono telecast programs. The five-watt RMS per channel stereo amplifier has a frequency response from 100 Hz to 10,000 Hz into 8 ohms with 2% or less total harmonic distortion. Separate bass, treble and balance controls are provided and an Extended Stereo switch offers enhanced stereo effect. Two speakers and video/audio input/output jacks give you even more versatility.

The Parental Control Provision allows you to lock out any channels for a 12 hour period. During this time these channels may be accessed only by a code which you create. A special Flashback button lets you alternately switch between two programs whenever you touch it. Great for watching two sporting events at once! Select up to 178 channels (except scrambled premium services) with quartz electronic tuning. The computer selector locks on to the exact frequency for precise tuning. An on-screen display shows you the channel you are watching and the time. The powerful Computer Space Command Remote Control lets you turn the TV on/off, select channels, scan programmed favorite channels, adjust volume, mute sound, recall channel and time on picture screen, operate the optional GSZ-4600 Antenna Switch, select TV stereo, monaural or 2nd audio operating modes, and operate Zenith VHS recorders.

With all but one circuit board preassembled and a built-in cross-hatch generator, this TV is easy to build and provides an enjoyable project. For the newest stereo television technology choose the GR-2700. And enjoy the additional benefits of economy and reliability which are found in every Heathkit product.

The GR-2700 must be assembled with the included cabinet.

Kit GRS-2700-1, 27"-diagonal TV with Modern Cabinet. Cabinet features nutmeg oak veneer. Includes concealed casters, two 3" x 6½" speakers and sunscreen glass. The Modern Cabinet measures 29⅜" H x 41" W x 18½" D. Shpg. wt. 208 lbs., Motor Freight **799.95**

[2] **Kit GRS-2700-2, 27"-diagonal TV with Mediterranean Cabinet.** Cabinet has simulated pecan finish. Includes concealed casters and two 5" x 7" speakers. The Mediterranean Cabinet measures 33" H x 47½" W x 18½" D. Shpg. wt. 199 lbs., Motor Freight **749.95**

Remotely switch between up to four video sources

Conveniently switch between video sources with your remote control or front panel control. Provides immediate, simple access to as many as four different antenna or RF input sources. Can be used with all Heath/Zenith televisions.

GSZ-4600, Assembled Antenna Switch Accessory, Shpg. wt. 4 lbs. **39.95**

[3] Rear projection TV gives you a big picture and big sound in a compact, space saving cabinet

$1895.00

- **45"-diagonal screen and complete stereo system with built-in decoder, 5-watt stereo amplifier and four speakers**
- **New Black Matrix screen reduces glare for easier viewing**
- **Parental Control feature lets you decide what shows your children watch**
- **Use it with your VCR or video camera**
- **Includes Computer Space Command remote control**

Quartz-controlled electronic tuning ends the need for fine-tuning adjustments and locks on to up to 178 channels (except scrambled premium services). The Black Matrix screen enhances picture contrast and absorbs room light to reduce glare and annoying reflections. Liquid-cooled CRT's and optically-coupled lenses provide exceptional picture contrast and brightness. You can even use the set with your VCR, video camera or video disc player.

A big sound system matches the big picture. The innovative Multichannel Stereo Sound System processes multi-channel television sound into exciting stereo. It also processes simultaneously telecast second audio programs or mono telecasts. The stereo power amplifier has an output of 5-watts RMS per channel with a frequency response from 100 Hz to 10,000 Hz into 8 ohms with 2% or less total harmonic distortion. You also get bass, treble and balance controls. 6½" round woofers and 2½" tweeters provide dramatic sound. Audio input/output jacks allow you to run the sound through your own hi-fi system or to run other audio equipment through the television's stereo system.

The remote control features Parental Control, Flashback and VCR functions. You can program the TV to make selected channels accessible only by inputing a secret code. Touch a button to alternate viewing between two stations, and use the remote to operate Zenith VHS recorders. Channel number and the time are displayed on the screen at the touch of a button. Scan favorite programmed channels with the Channel Up/Channel Down buttons.

Quart-controlled electronic tuning ends the need for fine-tuning adjustments and locks on to up to 178 channels (except scrambled premium services). The Black Matrix screen enhances picture contrast and absorbs room light to reduce glare and annoying reflections. Liquid-cooled CRT's and optically-coupled lenses provide exceptional picture contrast and brightness. You can even use the set with your VCR, video camera or video disc player.

Three times the viewing area of a standard 25" TV and big stereo sound are yours with Heath's GR-4500. This attractive rear-projection TV can be built in just 23 hours using the well illustrated and written assembly manual. All circuit boards except one are preassembled and it has a built-in cross-hatch generator. The cabinet is included with the GR-4500.

Kit GR-4500, Shpg. wt. 256 lbs. Motor Freight **1895.00**

[4] 19"-diagonal stereo TV at an economical price

$499.95

- **Parental Control and Flashback let you control viewing**
- **Built-in stereo system with decoder and 2-watt amplifier**
- **Black Matrix screen, Advanced System 3 technology and PRP circuit provide a great high-resolution color picture**
- **Convenient table-top size in modern, simulated walnut finish cabinet**

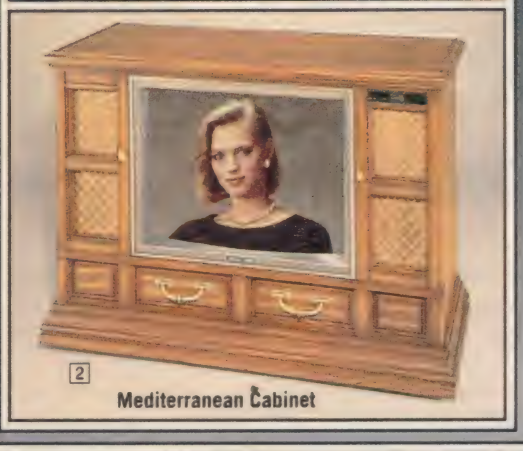
Turn any room into a state-of-the-art entertainment center with the conveniently-sized 19"-diagonal GR-1903. With the Full Stereo Sound System and Advanced System 3 chassis, this TV is loaded with technologically advanced features.

The Advanced System 3 provides an exceptionally sharp picture which is automatically color corrected every 30 seconds. The Video Filter and Peak Resolution Picture comb filter clean up the picture and provide resolution up to 25% greater than ordinary televisions. Quartz-controlled electronic tuning locks in on up to 178 channels (except scrambled premium services). The included Space Command Remote Control lets you control what your children watch and enables you to switch between your two favorite shows by touching the Flashback button. You also get bass, treble and balance control over the stereo sound of the dual speakers on each side and direct audio input/output. 14 hour kit with all but one circuit board preassembled and built-in cross hatch generator. 18"H x 26¾"W x 17"D.

Kit GR-1903, Shpg. wt. 100 lbs. **499.95**

[5] **GRA-1901-1, Mobile TV Cart** (shown), Shpg. wt. 10 lbs. **29.95**

VISA MasterCard **Discover the fun of kitbuilding at your Heath/Zenith Computers & Electronics Center.**



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Mediterranean Cabinet

Simulated TV pictures

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Modern Cabinet

Remote Control comes with all stereo televisions

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4

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Have complete entertainment in the home or on the go with quality video and TV equipment

1 Smaller than a paperback book – CASIO Color TV

- **Bright color picture on large 2.6"-diagonal screen**
- **Press a button and the electronic tuner scans the stations**

Take this color TV along on family outings. The tiny CASIO TV-1000 has a large 2.6"-diagonal high-resolution LCD screen and a speaker so the whole family can watch together. A backlight enhances viewing in the dark. The GVP-3413 also features electronic scan tuning; brightness, tint, color and volume controls; channel display; earphone jack and audio-video jack. Includes earphone. The GVP-3413 measures 3¼" H x 6⅜" W x 1⅜" D.

GVP-3413, Assembled, Shpg. wt. 3 lbs. **269.95**

2 Put the CASIO TV-21 television in your pocket

- **Continuous electronic scan tuning makes channel selection easy**
- **Ideal for viewing instant replays and action close-ups at sporting events**

This black-and-white TV is perfect for the businessman or sports fan. You can carry the GVP-3412 in your shirt pocket. It doesn't even need a rod antenna – the earphone cord acts as the antenna! The 2"-diagonal screen provides sharp, clear images. You select a channel simply by choosing either the UHF or VHF band and touching the up or down key. The GVP-3412 will scan to the closest station with a strong signal. The CASIO TV-21 has a channel display, tuning indicator, and volume and brightness controls. Includes earphone. The optional Backlight Accessory enhances night-time or dim light viewing. The CASIO TV-21 television measures a compact 2½" H x 4⅝" W x 1⅜" D.

GVP-3412, Assembled, Shpg. wt. 4 lbs. **89.95**

GVP-3412-1, Backlight Accessory, Shpg. wt. 1 lb. **14.95**

3 Hear stereo broadcasts with TV Stereo Adaptor

Stereo broadcast signals are rapidly becoming available from local TV stations. Enjoy these new stereo broadcasts with the GDZ-524 – the TV industry standard for decoding and playing broadcast stereo. The Stereo Adapter also decodes second audio programming and can be set for auxiliary stereo, extended stereo and mono audio. It works with either TV speakers or with your audio system. Has bass, treble and balance controls. Use with Heath GR-2502 or Zenith TV's with an "IF tap output." Add-on kits (below) available for other Heath TV's. Uses 120 VAC. 2¼" H x 16¾" W x 13⅜" D.

GDZ-524, Assembled and tested, Shpg. wt. 12 lbs. **189.95**

GDA-524-1, Cable Adapter Kit allows use of the GDZ-524 with Heath GR-1901, GR-1902, GR-2501, and GR-3000 TV's, Shpg. wt. 1 lb. **9.95**

GDA-524-2, Cable Adapter Kit allows use of the GDZ-524 with Heath GR-300, GR-400, GR-500, GR-2000, GR-2001, GR-2050 TV's, 1 lb. **9.95**

4 Add sophisticated TV technology to any size room

$329.95

- **Clean, life-like picture from Chromacolor Contrast picture tube and Advanced Color Sentry**
- **Precise quartz-controlled electronic tuning with Rapid Scan and Flashback features**

Enjoy the newest television technology when you add this 13"-diagonal screen TV to any room in your home. The Chromacolor Contrast picture tube features reflection-absorbing glass and jet-black matrix surrounding each phosphor element. As a result, colors are deep and realistic and contrast is excellent. The Advanced Color Sentry automatically corrects the color picture 30 times a second. Tuning alternatives include single-button channel scanning at a rate of up to 6 channels per second, and Flashback for switching between two programs at the touch of a button. Manipulate the quartz-controlled tuning with the remote control or front panel controls. The GRZ-1327 has 157 channel capability and is cable-ready. Measures 12¾" H x 18⅞" W x 15⅝" D.

GRZ-1327, Assembled and tested, Shpg. wt. 33 lbs. **329.95**

5 Deluxe six-head VHS recorder loaded with features

Designed for the future: Superb reproduction from four video and two audio heads, a built-in stereo decoder, VHS HiFi and dolby stereo make this the ultimate VHS recorder. A 14-day programmable auto-timer lets you select and record up to eight events with eight hours of recording and playback at SP (LP available for playback). Other features include: front self-loading; automatic rewind; two-way picture speed search; still picture; frame by frame advance; time remaining indicator; remote programming and slow and fast motion video action in forward and reverse and direct quartz tuning to 178 channels. Cable ready.

GDZ-4100, Assembled, Shpg. wt. 23 lbs. **999.95**

6 Six-head VHS recorder with MTS Sound

A rotary six-head scanning system plus Multi-Channel Stereo Sound produce excellent video and audio which are united for realistic, enjoyable viewing. Features stereo sound with automatic noise reduction; decoder for stereo sound and second audio program signals; front self-loading; 178 channel quartz electronic tuning; speed search and low noise continuous picture advance in SP and EP; 14-day, eight event programmable auto record. Includes remote control unit. The GDZ-3200 is cable ready.

GDZ-3200, Assembled, Shpg. wt. 23 lbs. **749.95**

7 Four-head VHS recorder with remote control

Useful and convenient features and an economical price team up to make the GDZ-2100 a sensible addition to your entertainment center. It includes: A 14-day, four-event programmable auto record timer; automatic front self-loading; four-head rotary scanning with SP or EP recording and SP, EP or LP playback; automatic rewind at tape end; 2-way picture speed search; still picture, pause and frame-by-frame viewing; selectable tape counter/lap-time indicator and 157 channel quartz electronic tuning with direct access and two speed up/down channel selection. Cable ready.

GDZ-2100, Assembled, Shpg. wt. 21 lbs. **499.95**

8 Economy VHS recorder fits into any budget

This VHS recorder has SP or EP speed for up to eight hours of recording and automatically switches to the correct speed for SP, LP or EP playback. Also has 14-day, one event programmable auto record timer; automatic front self-loading; instant record for up to eight hours; automatic rewind; 2-way speed search; still picture; time elapsed indicator; and 82 channel quartz electronic tuning with two-speed up/down channel scan. Includes remote control unit.

GDZ-1801, Assembled and tested, Shpg. wt. 21 lbs. **399.95**

9 Add realistic sound with Stereo Synthesizer

Turn your monaural sound into stereo sound with the Stereo Synthesizer. Simply add it to your TV or VCR to enjoy high-quality, realistic stereo sound with your favorite shows and movies. The ADP-1501 uses the same technique as professional studios to transform a monaural source into realistic stereo.

ADP-1501, Assembled and tested, Shpg. wt. 3 lbs. **99.95**

Finest quality Zenith VHS video tapes

GDZ-2000-2, T-60, Shpg. wt. 1 lb. **7.95**
GDZ-2000-3, T-120, Shpg. wt. 1 lb. **8.95**
GDZ-2000-4, T-160, Shpg. wt. 1 lb. **14.95**
GDZ-2000-5, T-120 SHG, for optimum quality, Shpg. wt. 1 lb. ... **12.95**

10 Mini-Cassette Video Movie Camera/Recorder

- **Sharp images every time with high performance 6X auto-focus lens**
- **Nine mode indicators and five alarm indicators simplify recording**
- **Lightweight, all-in-one camera weighs only 4.7 pounds**

See your movies immediately when you use this versatile and complete cassette-loaded video camera. Exposure is automatic and electronically monitored to deliver outstanding recordings. You can replay recordings through the viewfinder or through your TV and VCR.

You get an entire video system in one camera with the compact GDZ-6100. This mini-cassette camera/recorder has a high performance 6X auto-focus lens, electronic autofocus viewfinder, auto white balance, iris control, five alarm indicators, nine mode indicators and more.

GDZ-6100, Assembled and tested, Shpg. wt. 12 lbs. **1449.95**
GDZ-6100-1, Soft Carrying Case, Shpg. wt. 3 lbs. **29.95**
GDZ-6000-2, Compact Video Cassette, Shpg. wt. 1 lb. **7.99**
GDZ-6000-3, AC Power Supply/Battery Charger, Shpg. wt. 4 lbs. **129.95**
GDZ-6000-4, High Capacity Rechargeable Battery, Shpg. wt. 1 lb. **44.95**
GDZ-6000-5, Shoulder Mount and Strap, Shpg. wt. 1 lb. **39.95**

VISA MasterCard **Credit Card Orders Call TOLL-FREE: 800-253-0570. Alaska and Michigan Residents Call: 616-982-3411.**

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Simulated TV pictures

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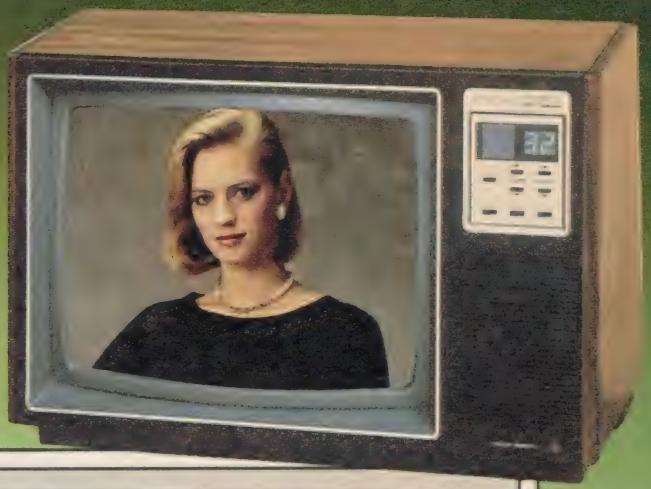

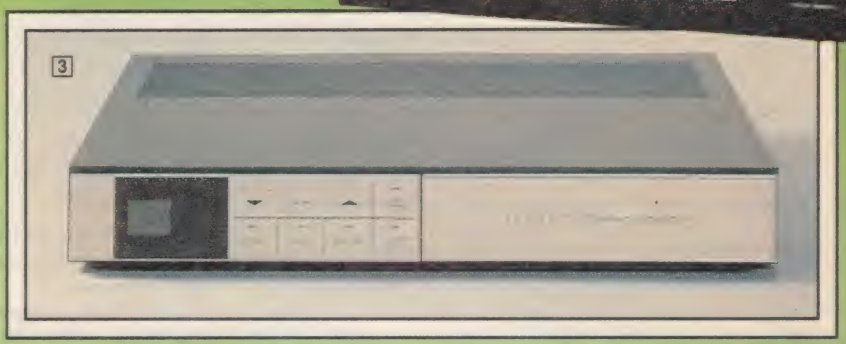

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For even more entertainment, add one of these accessories to your system

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One of these high quality VCR's is sure to fit your special needs and your budget

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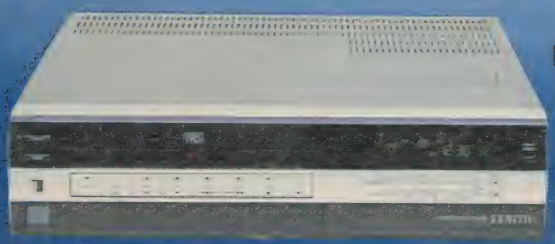

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10

A system in itself: a compact video movie camera/recorder using mini-cassettes

Save $100 when you add a new personality to the family with the HERO® JR. personal robot

Now Only
$299.95

- **Has a dynamic personality consisting of six traits**
- **Sings songs, tells nursery rhymes, plays games**
- **Guards your home and challenges intruders**
- **Wakes you up on time and announces special dates**

Meet the first affordable, personal robot with a dynamic personality...HERO JR. A friendly robot, HERO JR. will fit right in with your family and into your home. It sings songs, plays games, tells nursery rhymes, recites poems, guards your home and can even wake you in the morning and guide you through an exercise routine. HERO JR. explores its surroundings and seeks to remain near human companions. HERO JR.'s personality is preprogrammed and doesn't require computer programming skills to operate. If you do wish to program HERO JR., you can with a home computer and optional RS-232 Accessory and BASIC Cartridge.

The traits comprising HERO JR.'s personality include: singing songs like "Daisy" and "America"; saying preprogrammed phrases; exploring and moving about, using sensors to avoid obstacles and seek out humans; playing games; telling nursery rhymes; and gabbing in "Roblish." All routines are stored in 32K ROM. Add more functions with optional plug-in cartridges. In addition to these six traits, HERO JR. has an internal clock with a 100-year calendar that can even compensate for Daylight Savings Time. With this time-keeping ability, HERO JR. can act as an alarm clock and awaken you at a specified time. After your wake-up call, it listens to be sure you are awake or permits two tem minute snoozes if you desire. It can also be made to announce the week day, date and time at predetermined intervals or just at one important time and date. With 2K of RAM, HERO JR. can store and remind you of events such as birthdays and anniversaries – up to 16 dates per year.

A DEMO feature activates a built-in "Robot Variety Show" which demonstrates the Robot's ability to see, hear, speak, tell time and move. You can even participate in the show. To see, hear, speak, and to move about, HERO JR. uses a light sensor, ultrasonic sonar, sound detector, speech synthesizer and an internal clock which are controlled by an on-board computer using a Motorola 6808 microprocessor. The sonar is accurate from 4½" to 13.' An optional infrared sensor adds superior heat/motion detection. HERO JR. duplicates all English sounds using its Votrax SC-01 phoneme synthesizer. This permits the Robot to say just about anything. Volume and pitch adjustments tailor the Robot's voice to your liking. All of HERO JR.'s vocabulary is preprogrammed.

HERO JR. can guard your home against intruders and can be used with the GDA-2800 Security System (page 26). The Robot gives a verbal warning and asks for a password when its sensors detect a presence. The wrong or no response causes HERO JR. to activate the security system. HERO JR. normally speaks, sings and performs tasks between moving randomly about, however, an optional wireless remote unit allows the Robot to be manually driven from place to place. It will speak while under remote control. Remote operates at 75 MHz up to 100.'

HERO JR. is powered by two six-volt rechargeable batteries and plug-in wall charger (included). HERO JR. operates about 4 hours, with a normal amount of exploring. The robot will randomly enter a SLEEP mode which conserves battery power by keeping only critical circuits energized. You can also make HERO JR. enter or leave this mode. HERO JR. can carry your favorite beverage (up to 10 lbs.) in a 94 cubic inch compartment. HERO JR. has a 17-key keypad which lets you modify its personality to initiate a task. The keypad has clearly marked function keys including Sing, Play, Poet, Gab, Alarm, Guard, Help, Plan, Setup, and Enter. Eight LED's flash in time with speech. HERO JR. is 19" tall and is easily assembled in about 20 hours.

Kit RT-1, HERO JR., 32 lbs. ..... **Was $399.95 Now 299.95**

SAVER! Save over $165.00 on Kit RTR-1-5. HERO JR. with FREE Infrared Motion Detector and Cartridge Adapter accessories.
Shpg. wt. 56 lbs. ..... **Regularly $469.85 Now Only 299.95**

NEW! RTW-1, Assembled HERO JR. with RTA-1-1 Infrared Motion Detector, RTA-1-2 Remote Control, RTA-1-3 RS-232 and RTA-1-5 Cartridge Adapter accessories, Shpg. wt. 33 lbs. **499.95**

NEW! RTW-1-C, Assembled HERO JR. with RTA-1-3 RS-232 and RTA-1-5 Cartridge Adapter accessories, Shpg. wt. 32 lbs. **399.95**

50% OFF ACCESSORIES AND CARTRIDGES SAVER

Save 50% on all accessories and cartridges for HERO JR. when you buy them at the same time that you purchase the RTR-1-5, RTW-1 or RTW-1-C.

Accessory kits for HERO JR.:

RTA-1-1, Infrared Motion Detector Accessory detects rapid changes in temperature within a zoned range of approximately 35' long x 20' wide. Includes two window stickers that read "Warning, This Area Protected By A Security Robot." Shpg. wt. 1 lb. **119.95**

RTA-1-2, Remote Control Accessory offers manual, wireless control of HERO JR.'s movements up to 100 feet away, operates at 75 MHz, Shpg. wt. 2 lbs. .. **179.95**

RTA-1-3, RS-232 Accessory allows you to program HERO JR. in BASIC (RTC-1-8) from a terminal, or computer (requires HCA-10 or HCA-11 RS-232 cable on page 101 and terminal emulation software), Shpg. wt. 1 lb. **49.95**

RTA-1-4, Two extra batteries, Shpg. wt. 5 lbs. **59.95**

RTA-1-5, Cartridge Adapter, permits use of optional plug-in cartridges that increase HERO JR.'s capabilities. Includes additional 8K RAM, 1 lb. **49.95**

Plug-in cartridges for HERO JR. (all require installed RTA-1-5):

NEW! RTC-1-1, Trivia Quotes Cartridge plays like a popular trivia game. You guess which of four people made the statement, Shpg. wt. 1 lb. **39.95**

RTC-1-2, Songs, phrases and Rhymes #1 Cartridge increases HERO JR.'s vocal routines and automatically adds to the Robot's personality, 1 lb. **19.95**

RTC-1-3, Animals, Blackjack and Tic Tac Toe Cartridge enables you to play these additional games with HERO JR., Shpg. wt. 1 lb. **39.95**

RTC-1-4, Special Occasions Cartridge adds songs for special occasions, includes two versions of Happy Birthday (one using master's name), Jingle Bells and Auld Lang Syne, Shpg. wt. 1 lb. **19.95**

RTC-1-5, Math Master Cartridge, a timed math game, Shpg. wt. 1 lb. **24.95**

RTC-1-6, Riddle Robot/Tongue Twister Cartridge, Shpg. wt. 1 lb. **24.95**

NEW! RTC-1-7, Philosopher Cartridge lets HERO JR. randomly say philosophical phrases, or you can make the robot say a phrase, Shpg. wt. 1 lb. **39.95**

RTC-1-8, HERO JR. BASIC Cartridge contains special enhancements for speech, movement, sensors and integer math; and allows the owner to write programs using a video terminal or home computer running a terminal emulation program, requires RTA-1-3 RS-232 port, Shpg. wt. 1 lb. **49.95**

RTC-1-9, HEROBICS Exercise Cartridge offers 4 levels of difficulty and 10 exercises the whole family can benefit from, Shpg. wt. 1 lb. **29.95**

RTC-1-10, HERO JR. Program Language Cartridge, allows you to program the Robot through its keyboard, Shpg. wt. 1 lb. **39.95**

RTC-1-11, Musical Chairs Cartridge, play titled game plus Acey-Ducey and Robot Mind Reader with HERO JR., Shpg. wt. 1 lb. **34.95**

See Halley's Comet and explore the universe with this Cometron Reflector Telescope

Save $100
$399.95

- **Use your camera with the optional Drive Motor and Camera Mounts to photograph the heavens**
- **Super 4.5" Reflector attractively priced from Celestron**
- **Has two eyepieces and all optics are coated**

This is the year of Halley's Comet and the year to buy a telescope to view this phenomenon as well as dozens of other planetary and deep space objects. With this high quality Cometron Reflector Telescope from Celestron, you can view the rings of Saturn, Mars, the phases of Venus and four of Jupiter's moons! Show your children the Great Nebula, Andromeda Galaxy, and dozens of other celestial objects. You can even throw a "Comet Party" or two for you and your friends.

The TL-400 gathers 265 times the light of the human eye and all optics are coated. The Telescope features a German made precision equatorial mount with setting circles to help you locate new objects. Two eyepieces are provided: 25 mm for 40 power and 10 mm for 111 power. The TL-400 also includes a 6 x 24 Finderscope, accessory tray, dew shield and lens cap.

Photograph the heavens with your camera and the TL-400. Just order the optional Pulse Motor Drive and the appropriate Photography Set for your camera and enjoy an exciting evening of capturing the night sky on film. Enjoy many years of educational and pleasurable stargazing with the Cometron Reflector Telescope.

TL-400, (Some Assembly Required), 35 lbs. ..... **Was $499.95 Now 399.95**

TLA-400-1, Pulse Motor Drive for easy viewing and photography, compensates for rotation of earth to track objects, Shpg. wt. 2 lbs. **119.95**

TLS-400 Telescope T-mount Adapter and Camera Ring Set for your 35mm SLR, TLS-400-C, -M, -N, or -P (Specify for Canon, Minolta, Nikon or Pentax by using appropriate suffix such as TLS-400-N for Nikon), 1 lb. **29.95**

SAVER! Save $49.95 on the telescope with photography accessories when you order them as a system. The TLS-400-1 includes the Cometron Reflector Telescope. Pulse Motor Drive and Telescope T-mount Adapter and Camera Ring Set.

TLS-400-1 (Specify camera on order), 38 lbs. ..... **Was $599.95 Now 499.95**

Use your Visa or MasterCard credit card to purchase your kit!

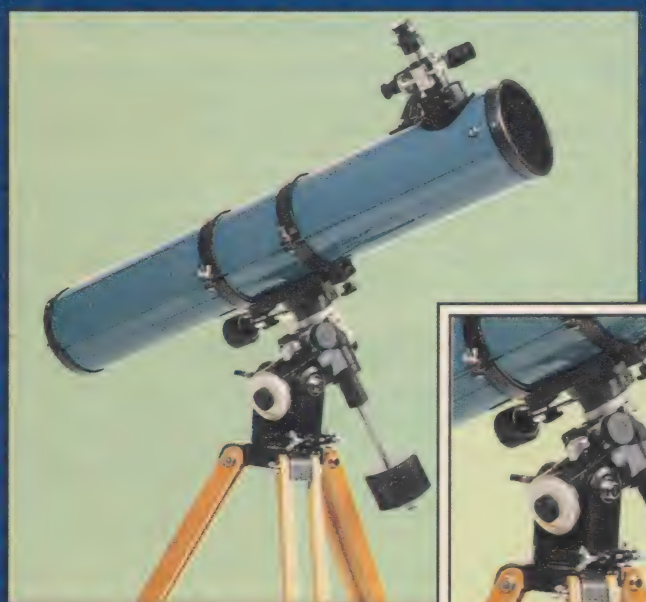
Alter HERO JR's "personality" using simple 17-key keypad

Moves about and avoids obstacles while remaining in your company

Discover the fun and enjoyment of owning your own personal robot...HERO JR., as he entertains you, your family and friends

Guards specific area of your home against intruders with sensitive detectors

Wakes you at the time you select, even allows you two 10-minute snoozes



Cometron Reflector Telescope

Photograph the heavens with Photography Set

Entertaining and educational for your whole family

Heathkit weather instruments add electronic precision and accuracy to forecasting

1 Heath's most advanced computerized weather station gives complete meteorological data instantly

$399.95 Kit

- **Displays time and date, indoor and outdoor temperatures in F or C, wind speed and direction, and barometric pressure – whether rising or falling and rate of change**
- **Microprocessor accuracy with memory storage of past weather data so that you can see weather trends**
- **Remote windcup – and weathervane transmitter**

Keep in tune with the elements with the Digital Weather Computer. It uses a microprocessor to give you past and present weather data to aid in forecasting activities. The most complete Heath weather station, the ID-4001 is ideal for professional weather watchers, farmers – for everyone going outdoors.

The Digital Weather Computer gives you the time in AM/PM or 24-hour format, and the date for log entries; both indoor and outdoor temperatures, whether above zero or below in Fahrenheit or Celsius; outdoor wind chill factor, plus the indoor/outdoor minimum and maximum temperatures since last memory clearance; instantaneous wind velocity with digital accuracy and 16-point compass resolution in mph, kph, or knots; the average wind speed and direction, and peak gust since last cleared; barometric pressure with four-digit accuracy, in selectable inches or millibars, and whether rising or falling.

Heath's electronic almanac has more memories to store data: It records high and low temperatures, minimum and maximum barometric pressures, peak wind speed and, most importantly, the time and date each occurred. The data is stored in memory until you choose to clear it. Even the rate of barometric change is calculated – so you know when a major storm is about to develop. Connection to an external battery will hold memory contents in case of power failure.

The anemometer, weathervane and remote transmitter were designed using an aerospace wind tunnel to ensure reliable operation and accuracy under adverse weather conditions. The transmitter has solid-state infrared sensors and optical encoding transmission technology to provide a high degree of accuracy. Barometer readings are derived from a piezo-resistive silicon bridge transducer that senses the most minute changes in atmospheric pressure. The four-digit readout has separate indicators to show whether the pressure is rising or falling. An output for interfacing the ID-4001 with a computer is available. A beautifully styled, solid oiled-walnut cabinet houses the Digital Weather Computer. IDW-4001 includes 100' of 8-wire cable. Order 8-wire (below) for kit ID-4001.

Kit ID-4001, Shpg. wt. 15 lbs. **399.95**

Computerized Weather Station factory assembled and tested.
IDW-4001, Shpg. wt. 25 lbs. **699.95**

ID-4001 SPECIFICATIONS: DIGITAL CLOCK/4-YEAR CALENDAR: Time Accuracy: Determined by accuracy of AC line. No accumulative error. **WIND VECTOR: Accuracy:** ±5% or better. **Direction Display: Accuracy:** ±11.25 degrees. **THERMOMETER: Temperature Range:** –40° to 70°C; (–40° to 158°F). **Accuracy:** ±1° on Celsius readings; ±2° on Fahrenheit readings. **BAROMETER: Pressure Range:** 28.00 to 32.00 in. Hg (inches of mercury), 981.9 to 1050 millibars. **Accuracy:** ±0.075 in. Hg. ±0.01 in Hg/°C. **Operating Temperature:** Outdoor assemblies, –40°C to +70°C (–40°F to 158°F). Unit, 15° to 35°C (59° to 95°F). **Power Requirements:** 120/240 VAC. Provision for external battery connection for memory backup during power failures. **Dimensions:** 7¼" H x 16" W x 6" D. **Weight:** 9 lbs.

2 Five-function weather station provides accurate data

$169.95

- **Monitors barometric pressure, indoor/outdoor temperatures, wind speed and direction**
- **Can be used to an altitude of 10,000 feet**
- **All solid-state circuitry requires minimum of AC power**

For the price you can't beat the features or the accuracy of the ID-1290 Weather Station. Designed for quality and reliability, it contains professional-grade sensors; all solid-state circuitry which operates from 120 VAC with minimum power consumption for maximum component life; and a non-corroding remote transmitter assembly that ensures years of trouble-free service.

Instant and accurate weather information: True indoor/outdoor temperatures are displayed in Fahrenheit and Celsius with a switch to select indoor or outdoor readings. A sensitive barometer helps you keep on top of the most significant changing atmospheric pressure conditions. Wind speeds can be read in one of two ranges: from 0 to 30 mph or from 0 to 90 mph. Eight wind direction indicators provide a 16-point compass resolution. The anemometer/weathervane mounts on any standard 1" to 1½" mast. The ID-1290 is a four-evening kit which may be wall-mounted or used as a desk set with the included stand.

Kit ID-1290, Shpg. wt. 8 lbs. **169.95**

ID-1290 SPECIFICATIONS: Wind Speed: 0-30 mph, ±2 mph; 0-90 mph, ±5 mph. **Direction:** 8-point readout over 360° **Temperature:** 0° to ±120°F. ±2°F (typ. INDOOR); –40° to +120°F (typ. OUTDOOR). **Barometric Pressure:** 28-31 inches of mercury within 0.5 inches, accurate up to altitudes of 10,000 ft. **Operating Temperature:** Receiver, 32° to 100°F; Transmitter, –40° to +120°F. **Wind Direction:** 16-point resolution by lighting two adjacent lights. **Dimensions:** Wall mounted, 20½" L x 7" W x 2" D. Desk mounted. 6¾" D. **Weight:** 7 lbs.

8-wire Cable for the ID-4001, ID-1290 and ID-1590 Instruments

IDA-1290-1, 50' cable, Shpg. wt. 2 lbs. **11.95**
IDA-1290-2, 100' cable, Shpg. wt. 4 lbs. **19.95**
IDA-1290-3, 150' cable, Shpg. wt. 6 lbs. **26.95**

3 Measure rainfall with Digital Rain Gauge

$99.95

- **Displays amount of rainfall up to 99.9 inches**
- **Select readings in 1/100th of an inch or 1/10th of an inch**
- **Noncorrosive, self-dumping rain unit**
- **Battery backup ensures operation during a power failure**

Never again wonder whether or not it's time to water your lawn or garden, just check the indoor display of your Digital Rain Gauge. Red LEDs display readings in either centimeters or inches. Place the attractive display indoors and mount the outdoor measuring device on a roof, fence post or antenna tower. Rainfall is recorded in 1/100th's of an inch up to 9.99" or in 1/10th of an inch up to 99.9." A 9 volt backup battery (not included) powers the unit during a power outage. The display measures 7" W x 5" D x 2½" H. Sensor unit measures 9" in diameter x 9⅝" H. Includes 60' cable and power cube. Operates on 120 VAC.

Kit ID-1795, Digital Rain Gauge, Shpg. wt. 7 lbs. **99.95**

4 Relative Humidity Indicator monitors air moisture

$99.95

- **Improve your environment and reduce heating costs**
- **Costs half as much as comparable units and offers more**

Save time and dollars when you know if it's dry enough outside to paint in the summer or time to turn on the humidifier in the winter. Unlike most hydrometers, which use animal membrane or hair, Heath's hydrometer uses a conductive film covered with a layer of gold for greater reliability. Two electronic sensors allow accurate readings both indoors and out. With both sensors connected the console displays alternate readings or can display one reading constantly. Includes 100' cable. Two or three evening kit.

Kit ID-2295, Shpg. wt. 6 lbs. **99.95**

5 Accurate Digital Wind Speed/Direction Indicator

$99.95

- **Check wind speed and direction with electronic accuracy**
- **Read wind speeds in mph, kph or knots, from 0 to 99**

The Digital Wind Indicator skimps on price but not on accuracy or reliability. The anemometer and weather vane are constructed on non-corroding waterproof materials for errorless readings under any conditions. The indoor console can be wired to report in two of three scales: mph, kph and knots from 0 to 99. Incandescent bulbs provide 16-point compass resolution by temporarily lighting two adjacent bulbs simultaneously. This three evening kit can be calibrated for true north or magnetic north and requires only two simple adjustments for operation. Requires 8-wire cable. Operates on 120 VAC.

Kit ID-1590, Shpg. wt. 7 lbs. **99.95**

6 Convenient Digital Indoor and Outdoor Thermometer

$89.95

- **Digital display of indoor and outdoor temperatures**
- **Continuous or alternating Fahrenheit or Celsius display**

Eliminate the guesswork in getting accurate temperature readings. This display can be easily seen – day or night. Measures temperatures from –30°F. to 120°F with an accuracy of ±1° from 20°F to 120°F, ±2° from –40°F to 120°F. The display indicates above- and below-zero temperature readings. Select Fahrenheit or Celsius scales, with a continuous reading of indoor or outdoor temperatures or alternate readings or both. 10' indoor and 75' outdoor cables included. Easy to assemble and calibrate, the ID-1390B operates at 120 VAC, 60 Hz (order ID-1390BE for 240 VAC, 50/60 Hz operation).

Kit ID-1390B, Shpg. wt. 4 lbs. **89.95**

VISA MasterCard **Credit Card Orders Call TOLL-FREE: 800-253-0570. Alaska and Michigan Residents Call: 616-982-3411.**

12 25 38
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BAROMETRIC PRESSURE
Digital Weather Computer
CLEAR
TEMPERATURE
PRESSURE
WIND
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1

2

Digital Rain Gauge takes the guesswork out of lawn and garden care

3

70
HEATHKIT
11
Wind Speed
HEATHKIT
+ 75

4 5 6

These accurate, elegant Heathkit clocks will be treasured timekeepers for many years

A Heath clock is always an attractive and useful addition to your home. And, you will enjoy a special pride and satisfaction when you build it yourself.

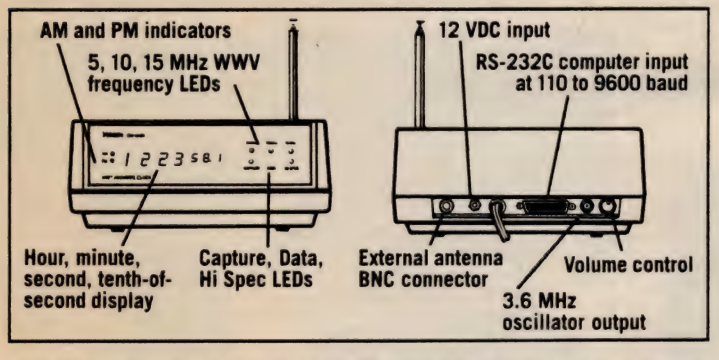
1 Have the ultimate in timekeeping accuracy with Heath's NBS atomic synchronized clock

$249.95 Kit

- **Synchronize with the NBS cesium atomic clock**
- **An accuracy of ±10 ms when Hi Spec LED lights**
- **An ASCII computer output provided by RS-232 Accessory**
- **Audio monitor allows you to listen to WWV broadcasts**
- **Operates on 120 VAC/60 Hz or 12 VDC battery power to use on land, sea or in the air.**

The National Bureau of Standards (NBS) provides the definitive time standard for the United States. You can lock onto this standard with the GC-1000 Most Accurate Clock for unparalleled accuracy. The GC-1000 sets itself to the correct time when it locks onto WWV, the NBS radio station. The Most Accurate Clock will reset itself to the correct time even after a power failure.

It's the first affordable, microprocessor-based time machine with a "Hi Spec" accuracy of ±10 milliseconds. The NBS radio station transmits a one-minute stream of time-code data containing day of year, hour and minute data in Universal Coordinated Time (UTC) with a correction factor for UTCI time, which compensates for the earth's rotational wobble.


AM and PM indicators
5, 10, 15 MHz WWV frequency LEDs
12 VDC input
RS-232C computer input at 110 to 9600 baud
Hour, minute, second, tenth-of-second display
Capture, Data, Hi Spec LEDs
External antenna BNC connector
Volume control
3.6 MHz oscillator output

An RF receiver scans the 5, 10 and 15 MHz frequencies of WWV and locks onto the strongest signal. A selectable audio monitor permits you to listen to the audio broadcast on these frequencies. To improve reception of WWV frequencies, an external antenna is recommended but may not be required in your area.

Ultimate accuracy: The front panel provides a bright digital readout in hours, minutes, seconds and tenths-of-seconds. An RS-232C Accessory allows this data, along with the date, to be fed to your computer.

LED's show which WWV frequency is being received, when 'capture' of the time-encoded NBS carrier occurs, when data is being received and when the Clock is at "Hi Spec" accuracy. Simple switch changes permit setting the Clock for any of the world's standard twenty-four time zones. During noisy reception conditions, the GC-1000 keeps time with its own crystal oscillator.

The RF receiver circuit board is preassembled for you and factory aligned for accuracy. Propagation delay can be set for up to 18.75 milliseconds, a distance of 3600 miles from WWV. Internal 3.6 MHz oscillator signal is available at the Clock's rear panel.

The GC-1000 Most Accurate Clock comes with a connector and seven feet of cable for connection to an external antenna. The Most Accurate Clock can be powered with standard home 120 VAC or by 12 VDC power supplies, such as marine or aviation storage batteries.

Kit GC-1000, Shpg. wt. 7 lbs. **249.95**

GCA-1000-1, RS-232C Output Accessory, Shpg. wt. 1 lb. **49.95**

GCW-1000, Assembled and tested Most Accurate Clock with RS-232C Output. Shpg. wt. 6 lbs. **425.00**

GC/GCW-1000 SPECIFICATIONS: Receiver: AM super heterodyne, single conversion with tuned RF amplifier. **Sensitivity:** 1 μV or less for 10 dB S+N/N. **Audio Output:** 250 VmW into 8 ohms. **Clock Accuracy:** Within ±10 ms when Hi Spec LED is on. **Internal Oscillator Output:** 3.6 MHz. **Power Requirements:** 120/240 ±15 VAC, 50/60 Hz @ 100 mA or 11-16 VDC @ 750 mA (150 mA with display turned off). **Dimensions:** 3⅞" H x 9" W x 6¼" D (9.8 x 22.9 x 15.9 cm) less antenna.

2 This modern digital floor clock is a stylish and useful timepiece for any home

Save $75

$174.95

- **Bright digital display adjusts to ambient room light**
- **Handsome cabinet makes this a valued furnishing**
- **Smoked glass shelves display books, knick-knacks**
- **Excellent kit for the first-time builder**

Add elegance to any room in your home with this distinctive Digital Floor Clock. The GC-1195 is housed in five feet of handsome simulated walnut-veneer cabinet with anodized corner pieces. The bright, 3¼"-high digital readout adjusts to surrounding light for a subtle gold-toned display. The display will flash when there has been a power disruption.

An attractive piece of furniture as well as a timekeeper, the Floor Clock will fit in with almost any decor. The clock features four smoked glass shelves. These ¼" thick shelves are perfect for showing off your knick-knacks, plants or books.

An excellent first-kit project, the GC-1195 Digital Floor Clock displays hours and minutes with the center colon pulsing once each second. The clock may be set to the correct time with two easy-to-use advance switches on the bottom of the clock chassis. Operates on 120/240 VAC, 50/60 Hz. 60½" H x 14" W x 9½" D.

Kit GC-1195, Shpg. wt. 58 lbs. ..... **Was $249.95 Now Only 174.95**

3 Enjoy Heath accuracy and style in the economical and fun-to-build Digital Alarm Clock

$29.95

- **Displays time in 12- or 24-hour format**
- **Snooze alarm, flashing display with power disruption**
- **Display automatically adjusts to ambient light**

The four-digit blue-green fluorescent display automatically adjusts to ambient light conditions. The GC-1107 displays hours and minutes in either 12-hour or 24-hour time (with AM/PM indicators in the 12-hour mode). A flashing display lets you know there's been a power disruption.

Space-age accuracy is provided by a metal-oxide semiconductor (MOS) integrated circuit. Fast and slow setting switches make it easy to accurately set the time. And rear panel switches make it easy to turn off the alarm or set the alarm for an extra 9 minutes of sleep.

Get started in kitbuilding today – and add a new pleasure to your life! Our easy-to-build Digital Alarm Clock kit includes a handsome simulated wood-grain cabinet, built-in speaker and an easy-to-follow assembly manual.

This practical Alarm Clock operates on 120 or 240 VAC, 50/60 Hz. Overall dimensions: 2¼" H x 7" W x 4¾" D.

Kit GC-1107, Shpg. wt. 3 lbs. **29.95**

4 Digital Wall Clock puts quartz-precision anywhere

$49.95

- **Quartz-crystal accuracy of ±1 minute per year**
- **Runs up to two years on a single 1.5 "A" alkaline cell**
- **1" high LCD digits provide a clear, legible display**
- **Displays time in 12- or 24-hour format**

Have the accuracy you'd expect from an expensive quartz watch with the GC-1720 Digital Wall Clock. A crystal oscillator and integrated circuit ensure the clock's split-second precision and reliability. The Wall Clock is easy to set when changing to or from daylight savings time, moving the clock or changing the batteries.

Battery powered operation eliminates worries about power outages and accidental disconnection. Put a GC-1720 Wall Clock in a cabin, RV, boat or just about any place since the case measures a slim 7⅛" wide by 5¼" high by 1½" deep.

This attractive Wall Clock blends with almost any decor since it is housed in a simulated oak wood-grain finish cabinet. The cabinet is also sturdy and lightweight, making it ideal for the boat or cabin.

The GC-1720 Digital Wall Clock is an easy-to-build beginner's kit that takes just one evening to assemble.

Kit GC-1720, Shpg. wt. 2 lbs. **49.95**

GC-1720 SPECIFICATIONS: Accuracy: ±1 minute per year, after adjustment according to instructions. **Display:** 4-digit and pulsing colon LCD, 1" digit height. **Time Format:** 12-hour or 24-hour. **Power Requirement:** One type "AA" 1.5 volt penlight battery (not included). **Battery Life:** One year with carbon-zinc cell; two years with alkaline cell. **Dimensions:** 5¼" H x 7⅛" W x 1½" D.

Discover the fun of kitbuilding at your Heath/Zenith Computers & Electronics Center.

1 The GC-1000 supplies the most accurate timekeeping available at an affordable price. Lock-in on the National Bureau of Standards atomic clock to have the universal time standard in your home or office.

Make an investment in yourself and your home with health, leisure time and home products

1 Improve your game year-round with Golf Trainer

$199.95

- **Immediately analyzes six important aspects of your swing**
- **Practice indoors or out using lightweight, portable unit**

A few minutes of practice on the Golf Trainer can be worth hours on the course. Take it with you to practice anywhere and improve your game. The microprocessor-controlled Golf Trainer uses electronic accuracy to analyze and provide a readout of your swing.

For each stroke, the Golf Trainer shows you: Head Speed so you can achieve a longer carry; Carry for determining loft in confined spaces; Ball Direction; Head Angle to improve body position; Duffing; and Out of Bounds to indicate an excessive offline shot. The Golf Trainer includes 2 tees, magnetic sheets for woods, adhesive seals and 3 plastic balls. Compact and lightweight, the Golf Trainer comes with a handy carrying case.

GDP-1433, Assembled, Shpg. wt. 10 lbs. **199.95**

2 Reliable thermometer with digital precision

$13.95

- **Be sure of temperature readings with accurate GXP-2121**
- **Tells you when the display reading is ready**
- **Easy enough for the babysitter to use**

Eliminate the annoying squinting and guessing that's required when you are using a conventional mercury-bulb thermometer. This thermometer provides easy-to-read digital accuracy from 89.6° to 107.6°F. And you get the results within 60 seconds! You are assured of having the correct temperature reading every time. The F symbol stops blinking when the peak temperature is displayed on the digital readout. The thermometer will display an "L" for temperatures below its range, and an "H" for temperatures above its range. Battery included.

GXP-2121, Assembled, Shpg. wt. 1 lb. ..... **Only 13.95**

3 Digital Thermometer for accurate measurements

$59.95

- **Accurately measure the temperature of liquids or air**
- **Weighs only 5.5 ounces and gives easy-to-read 4-digit temperatures in less than 10 seconds**

This electronic thermometer fulfills all your temperature needs whether monitoring a fever, developing film or fixing a baby's bath water. The Digital Thermometer's wand senses from 32° to 230°F (0° to 110°C) with ±0.2°F (±0.1°) biomedical accuracy and 0.5% overall accuracy with 0.1°F or C resolution. Bright red LED's display the temperature of liquids or air and it never needs calibration or mercury "shakedown." Operates on 9V battery (not included).

GD-1226, Assembled and tested, Shpg. wt. 2 lbs. **59.95**

4 Electronic Digital Blood Pressure/Pulse Monitor

Eliminate frequent trips to the doctor's office or clinic for blood pressure readings. Now you can take blood pressure and pulse-rate measurements at home with this easy-to-use and easy-to-read Monitor. Just put the cuff in place and inflate. Electronic metering does the rest for you! Unit includes batteries.

GXP-2120, Assembled, Shpg. wt. 2 lbs. **59.95**

5 Accurately monitor your weight with Digital Scale

$99.95

- **Battery operated for accuracy and safety anywhere**
- **No-wear electronic strain-gauge mechanism sensitive to weight change as small as 1/10 of a pound or kilogram**

This multi-purpose scale offers far more accuracy than mechanical scales. Dieters and fitness enthusiasts can closely monitor their weight, and everyone will enjoy a precision readout on items as small as 2 ounces and up to 300 lbs. An electronic transducer element eliminates the springs and weights that wear out on conventional scales.

Four bright, easy-to-read ½" digits display the weight. You decide whether to wire the kit to read in pounds or in kilograms. The Digital Scale features both manual and automatic modes. On manual, the display is on constantly. In the automatic mode the Scale conserves power by leaving the display off until weight is placed on the platform.

A manual zero adjustment makes it easy to weigh small items. This special offset feature means you can weigh the baby without weighing the blanket. The Scale is also safe to use after a shower. Requires 6 "C" batteries (not included).

Kit GD-1186, Shpg. wt. 9 lbs. **99.95**

6 Find buried valuables with Heathkit's Metal Locator

$249.95

- **Shaft collapses to 22 inches and head folds flat**
- **Easy-to-read meter installs for left- or right-hand users**

Find valuable objects where most locators are useless. A fully adjustable discrimination circuit filters background signals – screening out pulltabs, metal foil, bottle caps, ferrous and alloyed items. The Groundtrack gives you the sensitive pushbutton tuning of a quality metal locator at a low price.

Pinpoints treasures even in high-mineral soil. A very-Low-Frequency induction balance system provides silent operation until that coin or artifact enters the 6-inch diameter search head field of detection. Then a clear tone sounds that grows louder as you approach vertical center. Lightweight and collapsible, the Groundtrack operates on 6 AA cells (not included) or optional Rechargeable Battery Pack (below), which includes AC outlet and DC lighter socket chargers.

Kit GD-1290, Shpg. wt. 5 lbs. **249.95**

GDA-1190-1, AC/DC Rechargeable Battery Pack, Shpg. wt. 2 lbs. **29.95**

HDP-1396, Headphones, Shpg. wt. 2 lbs. **14.95**

7 Hands-Free Telephone Headset and Amplifier Adapter

$39.95

- **Comfortable headset is lightweight and adjustable**
- **Flip a switch to switch-over from headset to handset**

Your hands can work while you talk with the Hands-Free Telephone Headset and Amplifier by Nady. Plug the amplifier into the modular jack on standard business or home phone. Both the headset and your handset plug into the amplifier.

Flip an easy-to-reach switch on the top of the amplifier to switch between the headset and handset. Or, get up and move around without taking the trouble to remove the headset – a tug on the lightweight cord quickly disconnects you from the Amplifier. The cord clips to your clothing and out of your way. An LED shows when the headset is in use. A volume control on the Amplifier allows you to adjust the volume for up to 6 dB louder than conventional telephones! A Mute switch lets you turn off the sound through the Amplifier for private conversations. The Amplifier operates off phone line voltage so no batteries are needed. The built-in condensor mic has high definition for clear, clean sound.

GDP-1343, Assembled Hands-Free Headset, Shpg. wt. 1 lb. **39.95**

8 Enjoy cordless stereo headphone listening

Listen to your stereo or TV without disturbing others and without being tied in with a bothersome cord. The Infrared Stereo Headphone System by Nady uses infrared technology to convert sound into invisible infrared light waves. The waves are received by a sensor in your headphone and converted back into high quality stereo sound. The transmitter covers a conical range extending up to 35 feet in front of the transmitter. Transmissions will not penetrate walls. The transmitter plugs into the phone plug type earphone or headphone jack of any equipment. An AC power adapter is included. Adjustable-size headphone has volume control, on/off switch, battery compartment for the required DC 9V battery, and auxiliary jack so that it may be used as a standard headphone.

GDP-1432, Assembled Infrared Stereo Headphone System, 3 lbs. **89.95**

9 Program your doorbell to suit the occasion

$49.95

- **Program it to play up to 16 beats of your favorite tune**
- **Over 50 programmable melodies in songbook**

Watch your guests smile when they are greeted with a friendly song which you have chosen for this special occasion. You can program the doorbell with any tune, simply by arranging wire leads on a one-octave "keyboard" behind the front panel. The songbook includes 15 college songs, 7 seasonal songs plus 9 Christmas songs, 5 to commemorate special occasions and many more. The assembly manual has programming instructions for a variety of tunes. Has controls for adjusting volume, tone, speed and delay characteristics. Extra speakers may be wired on to the unit. The back door button activates a portion of the tune.

Kit TD-1089, Shpg. wt. 3 lbs. **49.95**

10 3-Tune Doorbell greets guests with beautiful music

Replace your ho-hum doorbell. This one plays three selections: an upbeat 4-note ring, Beethoven's Fur Elise and Romance. Runs on two "C" batteries and your present 10 to 16 volt doorbell transformer. For unlit doorbells. Volume control.

Kit TD-2089, Shpg. wt. 1 lb. **24.95**

Credit Card Orders Call TOLL-FREE: 800-253-0570. Alaska and Michigan Residents Call: 616-982-3411.

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Control your home with advanced monitoring, control and security systems and devices

BSR X-10 Home Control System commands up to eight groups of lights and appliances from one location

Design your own electronic home control system with BSR X-10 components. Control lamps and appliances with a single timer, by remote control, and by computer using the Heath Interface Kit. You can even turn on the air conditioner or the lights by phone. The wide variety of combinations and applications allow you to put together a system which will fit your own unique needs. Decide what types of control you want, order the components of your custom electronic control system and start creating!

[1] **The Mini Controller Console** is one of the most ingenious and useful home conveniences ever devised! Now, with a fingertip touch, you're in complete control by remote control, from beside the bed or wherever you plug in the Mini Controller. Console signals are transmitted over existing house wiring in the module of your choice. Just plug lights and appliances into the appropriate module.

Control up to eight groups of modules with as many modules as you wish in each group. Lamps and appliances in a group will go on and off together. Dim and brighten lights by holding a key down until lights are at the desired level. Single buttons allow you to instantly turn on all lights, or to instantly turn off all lights and appliances. Lights and appliances plugged into a module may still be turned on or off with their own switches.

Control lights, fans, TVs and stereos anywhere in and around your house from a single location. Or, place other Mini Controllers in different rooms for easy access to complete home control at all times. Since all commands are carried through the AC wiring of your home, your control can even extend to unattached garages, barns, sheds, and pool, porch or yard lights.

The Mini Controller acknowledges each command with a flashing red LED on the top of the unit. The console is housed in an attractive and compact case which may be handheld or easily mounted on a wall.

GDP-1550, Assembled, Shpg. wt. 2 lbs. **21.95**

[2] **Timer Command Console** runs everything on time. *Automatically!* Used with the modules, your home can run like clockwork, setting lights and appliances to your family's needs and lifestyle. The possibilities are virtually unlimited! Away for the weekend? The Timer is on guard, giving 24-hour control with a lived-in look and sound when you're gone – even simulates movement from room to room – *so it appears that someone is always home.* Features digital clock with two levels of display brightness. Fast and Slow set keys for easy setting and programming. Daily, Once, and a random Security code; Clear to erase a setting; All Lights On and Now for immediate security and control. No dimming feature. Now has full battery backup (four AA cells, not included) in case of power failure.

GDP-1520A, Assembled, Shpg. wt. 3 lbs. **69.95**

[3] **Telephone Responder Console** lets you enjoy the freedom of calling from anywhere to control up to 8 groups of 120 VAC items. Give your home a lived-in look by activating a TV or a radio to discourage prowlers. Or, give your home a call to turn on most 120 VAC electric heaters, furnace, or window air conditioners and fans depending on the weather. Includes modular phone cable. Control center measures 2¼" H x 5¾" W x 5½" D. Remote Responder measures 1¼" H x 2¼" W x 5¼" D and requires one 9 volt battery.

GDP-1515, Assembled, Shpg. wt. 6 lbs. **99.95**

[4] **The dream of a computer-operated home** or office is now a reality thanks to Heath's new 'universal' RS-232/C to BSR X-10 Interface kit! Connected between your present Heath or other computer and existing electrical wiring, it enables you to control up to 256 groups of modules with unlimited timing patterns.

The GD-1530 can be used with any terminal or computer system equipped with an RS-232C Serial Interface Port. No protocol is required or available. This port must be capable of a baud rate between 110 and 2400 baud to work correctly.

Programming syntax and simple MBASIC program samples, under H-DOS and CP/M operating systems, are included in the Appendix of the assembly manual. The command syntax for program control with the GD-1530 Interface is defined by the BSR format and is simple to learn and to use.

The GD-1530 Interface is a fast one-evening kit that can be assembled in about two hours. It has a red LED that flashes when a valid keyboard entry is being transmitted over the AC line. The GD-1530 operates on 120 VAC, 60 Hz and 3 watts. It measures 3" high x 6⅜" wide x 6⅜" deep (7.6 x 16.2 x 16.2 cm).

Kit GD-1530, Shpg. wt. 3 lbs. **99.95**

[5] **Lamp Module** receives signals from any of the consoles or from the GD-1530 Interface. Lamp modules can be used to turn incandescent lamps on and off and to dim and brighten lamps through 16 individual levels. The Lamp Module can handle a maximum of 300 watts.

GDP-1512, Assembled, Shpg. wt. 1 lb. **16.95**

[6] **Appliance Module** controls most other devices such as televisions, stereos, radios, coffee makers, fans, heaters and more. The Appliance Module also operates lights and self-starting fluorescents but only to turn them on and off. This module has maximum ratings of a 15 amp resistive load, ⅓ hp motor, 500 watt lighting load and a 40 watt TV/stereo load.

GDP-1514, Assembled, Shpg. wt. 1 lb. **16.95**

[7] **Burglar Alarm Interface Module** increases the effectiveness of your existing security system by controlling other BSR modules on your circuit. The Burglar Alarm Interface Module has low-voltage or contact closure trigger inputs. If an alarm is triggered, the module can turn on selected lights and appliances (such as a siren), or selected lights can flash on and off, or only selected lights can turn on.

GDP-1519, Assembled, Shpg. wt. 1 lb. **44.95**

[8] **Wall Switch Module** replaces existing standard wall switches. The GDP-1513 operates inside and outside lights by remote or local control. It responds to signals from any BSR console controller or the GD-1530 Interface. This module also brightens and dims lights in 16 steps through remote control. It can handle a maximum load of 500 watts.

GDP-1513, Assembled, Shpg. wt. 1 lb. **17.95**

[9] **Three-Way Wall Switch Module and Companion** with on/off control independent of control consoles. This module replaces hallway and upstairs/downstairs 3-way switches. Responds like a lamp module but also allows regular wall switch control of lighting. Handles a maximum load of 500 watts.

GDP-1516, Assembled, Shpg. wt. 1 lb. **24.95**

[10] **Air Conditioner Module** is a standard 240 VAC receptacle for air conditioners that is rated for a 15 amp load. See the GDP-1517B below for alternate perpendicular-pronged type plug arrangement.

GDP-1517A, Assembled, Shpg. wt. 1 lb. **39.95**

[11] **Perpendicular-Pronged Air Conditioner Module** is also a 240 VAC receptacle for air conditioners, but this module accepts perpendicular-pronged AC plugs and is rated for a higher 20 amp load. See the GDP-1517A above for the standard-type plug arrangement.

GDP-1517B, Assembled, Shpg. wt. 1 lb. **39.95**

Thermostat Control Set allows control of existing heating and air conditioning thermostats. Set includes one Temperature Regulator and one Low-Voltage Adapter. The Low-Voltage Adapter plugs into a wall or appliance module controlled by the GDP-1520A Timer or GDP-1515 Telephone Responder.

GDP-1521, Assembled, Shpg. wt. 1 lb. **49.95**

[12] Save $50 while providing security and lighting with the Passive Infrared Security Light Control

- **The GD-3511 turns on lights to make an intruder believe he has been seen – scaring him off without disturbing your neighbors**
- **Passive heat sensor detects movement and activates security lighting before intruders have a chance to damage your property**
- **Replace expensive, all-night floodlights with automatic security lighting with the GD-3511 and your own lights or the GDA-3511-1 Dual Floodlight**

Light is the most efficient deterrent to crime, and the Heathkit GD-3511 turns on up to 500 watts of light when security lighting is needed. The system is especially effective because lights are activated only when an intruder is present. Prowlers believe they have been seen if lights suddenly go on when they enter a protected area. Sensor controlled lighting also saves you money since lights are on only when you need them.

A passive heat sensor detects body heat (infrared energy) when an intruder enters the covered area. The Control then activates security lights – even an interior/exterior alarm can be sounded. An adjustable timing circuit automatically turns off lights after motion has stopped. A built-in photo-transistor deactivates the GD-3511 during daylight hours to save you money and maintain the belief that the lights are turned on by yourself, not a sensor.

Sensitivity, coverage pattern and lighting time are adjustable. You decide if you want the alarm to detect stray cats and dogs or just intruders and larger heat-emitting objects. The sensor unit is gimbal mounted so that you can also control the size and shape of the coverage area. The GD-3511 has a typical operating

Use your Visa or MasterCard credit card to purchase your kit!

range of 35' with a coverage width of 35.' Lights remain on from ten seconds to more than fifteen minutes once motion stops in the protected area.

Use your existing floodlights or doorlights or use the GDA-3511-1 Dual Floodlight Accessory which attaches to the Lighting Control. The wall-mount unit houses two adjustable aim floodlights. Both Control and Accessory are weather resistant and are inconspicuous in appearance. The Security Light Control connects to a standard 120 VAC, 60 Hz power line and consumes only one watt when operating but not activated.

Kit GD-3511, Shpg. wt. 4 lbs. ..... **Was $149.95 Now Only 99.95**
GDA-3511-1 Dual Floodlight Accessory, Shpg. wt. 5 lbs. **29.95**

13 Have 24-hour protection – verbal commands and up to eight floodlights protect your home

- **Effective infrared sensors detect intruders and activate system**
- **Commanding digitized male voice warns intruders – day or night**
- **Adjust the coverage area pattern and size to fit your needs**
- **Voice-Off feature lets you deactivate the verbal warning while unit continues to light the way for family members and guests**

Security Sentinel uses both light and sound to deter intruders, for maximum 24-hour-a-day security. Intruders believe they have been seen when the GD-3810 responds to their approach with a commanding verbal warning and, at night, activation of up to 1200 watts of lighting equivalent to eight 150 watt floodlights.

Infrared sensors detect body heat within the coverage area and activate the verbal message which is a man's voice that has been digitized for realistic reproduction. The message is: "Warning. You are entering a secured area. Please exit immediately." During darkness, security lighting can also be activated. Peripheral lighting is deactivated during the day. Quickly turn your switch off and on again to deactivate the verbal warning for up to eight minutes while the unit still lights the way for a family or guests. If more guests approach before the light goes off the unit automatically deactivates the verbal warning for an additional time period of the same length. Your family or guests never again have to approach the house in darkness.

Even the area underneath the unit is covered, providing complete coverage of an area of up to 40' by 40.' You can adjust the coverage area size and pattern to suit your needs. You can also set the sensitivity level of the sensors to detect stray animals or only intruders and larger heat-emitting objects. Connects to a 120 VAC, 60 Hz household power line and works with the GDA-3511-1 Dual Floodlight Accessory. 12½" D x 5¾" W x 3½" H.

Kit GD-3810, Shpg. wt. 6 lbs. **199.95**

Team up the SMARTHOME I Controller with your computer for home control and security

$299.95

- **Awaken to fresh coffee, a warm house and the morning news every day – and turn in at night knowing appliances are off and your home is being monitored by the GD-3800**
- **Have a computer controlled home without monopolizing your computer – the GD-3800 runs your home by itself once it has been programmed and plugged into an AC outlet**
- **Convenient handheld transmitter also provides remote appliance and lighting control from your easy chair**

Your home can run better than clockwork with the GD-3800 SMARTHOME I Controller. The SMARTHOME system allows control of home lighting, appliances, heating, air conditioning, and a wide variety of electronic devices. You program the GD-3800 to turn lights and appliances on and off, or to dim lights at specific times through powerful software and your home computer. The GD-3800 controls lamps and appliances by using the existing house wiring – just plug BSR lamp and appliance modules (see page 24) into wall sockets and then plug your lamps or appliances into the modules.

A built-in receiver detects signals from an included handheld transmitter or from optional Heath GDA-2800 series RF transmitters (see below). This means that your home is controlled not only by the programmed unit but also remotely by transmissions from your handheld unit or a sensor. You can touch a button on the handheld transmitter to dim a light or turn on the stereo, or a transmitter can sense your entry into a room and turn on a light for you. Place sensors around the house to monitor a variety of conditions such as window/door open or closed, smoke present, and movement in a room or hall. When a sensor notes a change it transmits a signal to the control unit. The control unit then responds by sending the appropriate command to the modules in that area of the house.

Easy to use software lets you draw your floorplan on your monitor and use icons to install actual lights and appliances int he correct locations. You can enter up to six floor plans and can even include outdoor fixtures such as pool or driveway lighting. The Controller can then be easily programmed to activate or brighten/dim lamps or select appliances at specified times. All the programming information is stored in the Controller's memory so that the unit may be disconnected from your computer. You can create a number of programs and save them on a separate disk. This allows you to change your household's routine for weekends or vacations by simply transferring the information to the Controller via a computer link.

Use the SMARTHOME I Controller, software BSR modules for preprogrammed and remote control of your home. Add sensors or a whole security system from the GDA-2800 series to have both preprogrammed control and a home in which appliances and lights respond to events the sensors detect. For even more protection, add the GD-3880 Alarm Center below. The GD-3880 requires one of the software packages listed below.

[1] **Kit GD-3800** SMARTHOME I Controller and Remote Control Unit, Shpg. wt. 5 lbs. (Available June) **299.95**

Order the required software for your home computer:

GDA-3800-1, Software for Z-150/IBM PC, Shpg. wt. 1 lb. **99.95**
GDA-3800-2, Software for Z-100 series, Shpg. wt. 1 lb. **99.95**
GDA-3800-3, Software for Apple II, II+, IIe, IIc, Shpg. wt. 1 lb. **99.95**
GDA-3800-4, Software for Macintosh, Shpg. wt. 1 lb. **99.95**

This device has not been approved by the Federal Communications Commission. It is not, and may not be, offered for sale or lease, or sold or leased until the approval of the FCC has been obtained.

[2] Alarm Center alerts you and keeps intruders away

Four distinct alarms respond to different emergencies so you know what is wrong. You determine what type of emergency each of the four alarms will indicate. A priority system selects the most important alarm to be sounded should more than one emergency be detected. The Alarm Center is an invaluable accessory for the GD-3800 Controller. Each input can be activated by an external normally-open switch such as a mat switch or light-beam-controlled relay contact. Includes power cube and 12 volt storage battery which supplies backup power for up to 10 hours in case of a power failure. Also includes 25' cable for connection to GD-3800 Controller. Measures 17"W x 8.3"H x 8.5"D.

Kit GD-3880, Alarm Center, Shpg. wt. 16 lbs. **299.95**

Sensor-activated GDA-2800 RF Security System gives total home protection

A professional-quality security system, the GDA-2800 provides thorough, 24-hour coverage of your home. The system installs in a day to protect interior/perimeter zones, entrances and high risk areas. Your family can enter and exit without triggering alarms simply by punching in a secret code on the transmitter keypad mounted near your door. For computer control of your secured home, use the GD-3800 (above) with the GDA-2800 sensors.

- **One of the most advanced microprocessor-controlled systems available**
- **RF control eliminates the hassle of wiring and possible tampering**
- **A variety of sensors and transmitters monitor your home and alert the receiver of intruders or emergencies**
- **Key lets you lock the system on or off**

[3] **RF Security Receiver/Processor Kit** processes all incoming signals from the various transmitters and provides appropriate alarm warning action. The Receiver and transmitters are set to a unique house code which you select – eliminating false alarms from other radio frequency transmissions. Three modes (Off, Home, and Away) control the entire systems operation. 'Home' monitors doors and windows while you're inside. 'Away' provides complete security by additionally arming indoor motion detectors. Five coded channels give separate alarms for door, windows, indoor motion, and fire and emergency situations. When the Receiver is set on the Off mode two emergency alarm channels – 'Auxiliary' and 'Panic' – alert you to special concerns like fire, breach of computer room, safe or gun cabinet.

The kit includes an indoor/outdoor alarm horn and indoor annunciator. The receiver has provisions to operate two alarm horns. The annunciator sounds a two-note signal to indicate a protected door being opened when the Security System is in the OFF mode, and indicates selection of a new operating mode.

The Receiver may be set for instant or time delayed exit and entry alarms. This allows family members easy access when using the Wall-Mounted Keypad Controller. You may also lock the System power on or off with a key switch.

Other sophisticated features include: four output triggering options for automatic dialing devices; power to drive two alarm horns; an internal 12-hour stand-by battery; highly visible security warning labels for house exterior; and a system test mode. The system permits enforcement to be extended to nearby buildings, shed or garage within 200' receiving range. All Receiver mode operations are remotely controlled by the handheld GDA-2800-4 Command Transmitter or the GDA-2800-9 Wall-Mount Keypad Transmitter (at least one is required).

Kit GDA-2800-1, Shpg. wt. 24 lbs. **299.95**

[4] **Passive infrared Motion Detector/Transmitter** offers 25 x 35 foot indoor space protection without interference to TV remotes. Requires 9V battery.

GDA-2800-2, Assembled, Shpg. wt. 1 lb. **149.95**

[5] **Wired-Circuit Transmitter** protects doors and windows against entry, includes one magnet/reed switch. Also connects to GD-1701 Flood Alarm (page 6).

GDA-2800-3, Assembled, Shpg. wt. 1 lb. **39.95**

[6] **Command Transmitter** remotely controls entire System within 200' range.

GDA-2800-4, Assembled, Shpg. wt. 1 lb. **49.95**

[7] **Smoke Detector/Transmitter** sounds internal 85 dB alarm as well as GDA-2800 Security System alarm.

GDA-2800-5, Assembled, Shpg. wt. 2 lbs. **79.95**

[8] **WINDOW BUG Sensors and take-off contacts.** Package of four. Used with GDA-2800-3 Transmitter, each sensor protects up to 32 sq. ft. of glass surface.

GDA-2800-6, Shpg. wt. 1 lb. **49.95**

[9] **Magnetic/Reed Switch Set.** Package of four (one set shown) for single or parallel connection to GDA-2800-3 Transmitter and its applications.

GDA-2800-7, Shpg. wt. 1 lb. **24.95**

[9] **Passive Infrared Motion Detector** for hard wired security systems. Requires 6-18 VDC. (Not for use with GDA-2800 or GD-3800 security systems.)

GDA-2800-8, Assembled, Shpg. wt. 1 lb. **99.95**

[11] **12-Button Digital Keypad Controller** operates in addition to or in place of the GDA-2800-4 Command Transmitter. Mounts near door for instant entry/exit control. Operates identically to the Command unit after entry of user access code.

GDA-2800-9, Assembled, Shpg. wt. 2 lbs. **119.95**

GDA-1800-3, Additional Outdoor Alarm Horn (like shown), 3 lbs. **24.95**

SAVER! GDS-2800-1 Starter Security System consists of one GDA-2800-1 Receiver kit, one GDA-2800-2 Infrared Motion Detector/Transmitter, one GDA-2800-3 Wired-Circuit Transmitter and one GDA-2800-4 Command Transmitter, Shpg. wt. 43 lbs. **499.95**

VISA MasterCard **Credit Card Orders Call TOLL-FREE: 800-253-0570. Alaska and Michigan Residents Call: 616-982-3411.**

2
Alarm Center has four different warning signals
The SMARTHOME I Controller and Alarm Center bring intelligent control and security to the home
1
Program the Controller to run your home lights and appliances
3
11
5
9
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10
6

Add security and convenience to your home with these reliable products

[1] Vacation/Home Sentry ends homeowner worries

$29.95

- **Device detects low in-house temperatures – add more sensors to detect water, freezer door ajar, etc.**
- **A quick phone call to your home activates the Vacation Home Sentry and alerts you if something is amiss**
- **Helps to prevent extensive damage and costly repairs to your home**
- **Easy-to-build kit with detailed instruction manual**

Now you can leave for your vacation or your seasonal home care-free when you have the Vacation/Home Sentry watching over your home. This low-priced electronic sentinel performs an invaluable service while you are away. It watches over your home and turns your telephone into a home information line.

You or a neighbor can simply call your home phone number to find out if all is well. The Vacation/Home Sentry monitors the house temperature with its built-in sensor. If the temperature drops below 45°F you will hear a steady 5 to 10 second tone after the first ring. If the temperature is normal, you hear silence.

Add optional exterior sensors to detect a wide variety of problems such as flooding, opened doors or windows, and freezer failure. The number of applications of this useful unit make it an exceptional value. The Vacation/Home Sentry can save you large sums of money should a potentially costly incident, like a flood, or heating or power failure, occur. The Vacation/Home Sentry is an easy and enjoyable kit to build and install. It is powered by two 9-volt batteries (not included) which draw current only when responding to a call.

Kit GD-1702, Shpg. wt. 2 lbs. **29.95**

[2] Protect your home from theft and damage with the ever vigilant SENSAPHONE Home Monitoring System – it calls and tells you when something is wrong

- **Automatically dials designated numbers and warns of problem in English**
- **Reports status of unattended home or office when you telephone – or audibly at your command**
- **Use as an automatic dialer that stores up to eight phone numbers**
- **Batteries operate the SENSAPHONE for up to 15 hours during a power failure**

Become the owner of a unique home monitoring system that informs you of conditions in your unattended home or office. SENSAPHONE continuously checks for power outages, excessively high or low temperatures, unusual sounds and disturbances like a smoke alarm going off. At the sound of an intruder or alarm the SENSAPHONE calls you and reports the problem in English. It then switches on a sensitive, built-in microphone so that you can hear what's happening.

Add more monitoring functions by attaching additional sensors to the unit. You can have the unit respond to doors or windows ajar, flooding and a number of other situations (see the GDA-2800 Security System on page 26).

Connected to your phone, SENSAPHONE reacts to an alarm condition by automatically dialing up to four pre-selected telephone numbers in sequence. It continues to call until the warning message is received and acknowledged. SENSAPHONE talks to the receiving party by identifying itself, giving the time, stating the problem and switching on its built-in microphone.

Listen in on your house while you are away. Just call home. After a preprogrammed number of rings, the unit answers and reports on all monitored conditions. Then it lets you listen to room sounds for yourself. Reassured, you can return to work or to enjoying your vacation.

SENSAPHONE keeps working even though there's a power failure. It automatically switches to its battery power – six "D" cell alkaline batteries (not included) - and calls to warn about the loss of electricity. It will also call out when its batteries are running low. Batteries last up to 15 hours when AC power is lost and the unit is in the ON mode and operational.

As an extra to your small investment, SENSAPHONE can be used as an automatic dialer. It stores up to eight of your most frequently called numbers and dials them for you when you press a one-key code. SENSAPHONE also gives the time and any monitored condition audibly at your command.

SENSAPHONE easily installs in a few seconds on any telephone line using a standard telephone modular jack. It can be used with or without a telephone. It measures 7¾" wide x 8⅝" high x 8⅝" deep and weighs 2 pounds.

GDP-2156, Assembled and tested, Shpg. wt. 3 lbs. **199.95**

Dependable Heath products for your automobile – from test equipment to a mobile Siren/PA

[4] Siren/PA for mobile public services

$109.95

- **Includes hi-lo siren circuit and provision for multi-mode emergency lighting control**

This compact, 55-watt siren has automatic or manual wail, hi-lo emergency tone and yelp to accommodate different traffic situations. A 20-watt public address circuit amplifies your voice for outside announcements and allows you to monitor incoming radio calls while away from the vehicle. Low-noise, push-to-talk microphone will instantly go from any siren to clear audio-PA mode.

IMPORTANT: This product is designed for use in emergency vehicles. Consult authorities before installing or operating.

Kit GD-1810, Shpg. wt. 6 lbs. **109.95**

GDA-18-1, Weatherproof Exterior Horn Speaker, assembled, 10 lbs. **109.95**

Kit GDA-18-2, Concealed Grill Speaker, Shpg. wt. 10 lbs. **109.95**

Kit GDA-1558-1, Emergency Lighting Relay, Shpg. wt. 1 lb. **4.95**

[5] Wiper Delay makes driving safer

The inexpensive CH-1068 is an easy, one evening project that keeps your view clear on the highway. Kit includes test lamp with special instructions to locate and identify hookup leads in your auto wiring system. Designed to fit most single and 2-speed wipers. Incompatible with motor-reversing hidden wipers; contact your auto dealer for specifics. Unit mounts quickly and easily using gimbal bracket or double-sided tape strip.

Kit CH-1068, Shpg. wt. 2 lbs. **21.95**

[6] Exhaust Gas Analyzer for tune-up evaluations

Perhaps the best way to guarantee your engine is running at maximum potential and emitting as few pollutants as possible is by testing it with the Heathkit Exhaust Gas Analyzer. A CI-1080 can monitor for minimum pollution, review the emission control system and indicate positive diagnosis.

By measuring thermal conductivity of your exhaust gases, it can show the air-to-fuel ratio, overall combustion efficiency and percentage of carbon monoxide present. From these you can determine if an auto's fuel mixture is unnecessarily too rich or lean for best economy. It's essential when tuning up engines to meet a specific rating for clean air standards in many states. Not intended for use with Chrysler "lean burn" engines.

To facilitate setup, the easy-to-read, 4½ color-coded meter is designed to hang on a partly open window or stand upright without marring paint finishes. The removable sensor/probe assembly uses a flexible stainless steel tube for safe routing of all gaseous material. The CI-1080 is housed in a rugged polyduralene case with foldaway handle for easy portability and storage. Powered by 6 or 12-volt battery in auto under test. All accessories included.

Kit CI-1080, Shpg. wt. 6 lbs. **129.95**

[7] Portable digital Engine Analyzer

$139.95

- **Measures dwell angle, engine speed, DC voltage, resistance and current**
- **LCD display is easy to read even in bright sunlight**

With this self-powered portable digital analyzer, you can make critical tune-up measurements to help determine if your vehicle is operating at peak performance. Check dwell on 4-, 5-, 6- and 8-cylinder engines from 0 to 90° within ±0.2%. Check idle speed in two tachometer ranges up to 10,000 RPM with an accuracy of ±0.1%. Measure DC voltage in two ranges up to 200 volts at ±1.5%, current to 20 amps with ±3% accuracy and resistance to 2 megohms at ±1.5%.

Using the optional Shunt Accessory (below) the digital Engine Analyzer can measure starting current and battery charge/discharge currents. The Engine Analyzer requires a 9-volt battery (not included). The Analyzer displays circuit polarity, low battery and over-ranges. Includes carrying case.

Kit CM-1551, Shpg. wt. 5 lbs. **139.95**

CMA-1550-1, 400-Ampere Shunt, 1 lb. **15.95**

Discover the fun of kitbuilding at your Heath/Zenith Computers & Electronics Center.

3 The Informer Ultrasonic Intrusion Alarm keeps a watchful eye in your home

$79.95

- **"Sees" up to 25 feet away from unit**
- **Time delay lets you deactivate the alarm**
- **Two sockets included for connection of a lamp and alarm**
- **Disguised to look like a fine hardcover book**

No one but you will know it's here. Disguised to look like a fine hardcover book, the Informer sits quietly on the bookshelf or table...until someone invades its field of surveillance. Then it can activate indoor alarms, outdoor bells, table or floor lamps...to alert you to an unfamiliar presence in your home.

Easy operation: Simply flip a hidden, back panel switch to activate the system. A soundless signal is transmitted throughout the room or area, bounced off the walls and returned to the receiver. Any movement that interrupts the transmit signal is perceived by the receiver. Ten seconds after the movement is first detected the lamp outlet is triggered, turning on a table or floor lamp. Approximately 30 seconds later the alarm outlet is triggered, activating alarms.

The built-in time delay between light and alarm activation allows you to enter the room and deactivate the Informer with a switch before the audible alarm is triggered. A second switch on the back of the unit lets you set the lamp and alarm for automatic reset after the alarm has sounded for 25 seconds. This switch also has a normal position so the audible alarm continues to sound until the unit is manually reset. The Informer makes a convenient automatic light switch in dark hallways, or it can be used to alert parents that a child has left its bed. An adjustable control sets the Informer's sensitivity to movements, and therefore its operating range. The Informer is simple to build and its solid-state circuitry ensures years of trouble-free service. It requires 120/240 VAC. The unit measures 2⅜" W x 10⅛" H x 7½" D.

Kit GD-49, Shpg. wt. 5 lbs. **79.95**

GD-49 SPECIFICATIONS – Operating range: Varies with installation. Typical maximum range is 25 ft. **Operating times:** Turn-on delay: approximately 10 sec. Alarm delay: 20 to 30 sec. (lamp-on time). Automatic reset delay: 20 to 30 sec. (alarm-on time). **Ultrasonic frequency:** Approximately 41 kHz. **Power outlets:** Two AC sockets: One for Lamp, one for Alarm. **Power outlet current:** Three amperes total for both. **Power requirements:** 120/240 VAC, 50/60 Hz, 1½ watts. **Dimensions:** Chassis only, 2" W x 9¼" H x 7" D (approximately). In book-style cover, 2⅜" W x 10⅛" H x 7½" D (approximately).

8 Reliable Electronic Ignition Tester saves time

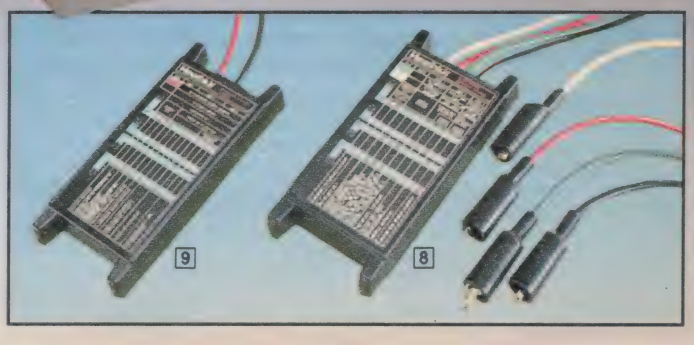
Perform four tests that quickly tell you: if your battery is sufficiently charged; if the reluctor and pickup coil are providing an input to the ignition module; if the ignition module is properly switching the coil primary; and the location of a faulty component in the ignition primary circuit. Requires some ignition knowledge. Pickup coil test does not work on Hall-effect ignitions. Keep one handy in every family vehicle for troubleshooting unexpected breakdowns on the road.

Kit CI-2055, Shpg. wt. 2 lbs. **24.95**

9 Low-cost Charging System Tester finds trouble

Two-wire setup and three quick tests tell you: if the battery has sufficient charge to reliably start the engine; if the battery is being charged by the alternator; if the voltage regulator is at fault (causing the battery to become overcharged); and if the alternator stator windings and rectifier diodes are functioning properly. No external power or battery required. Don't be stranded without one!

Kit CI-2065, Shpg. wt. 2 lbs. **24.95**



Heath products that make your home more energy-efficient. convenient and healthful

[1] Improved Electrostatic Furnace Air Cleaner

$149.95

- **Removes pollen, cigarette smoke and dust – purifying air for allergy sufferers and protecting computers from harmful airborne particles**
- **New power supply now designed with high speed switching**
- **Red LED indicates proper Air Cleaner operation**
- **Four sizes of 1" thick filters make installation a breeze**

Today's well-insulated homes need the Heathkit Furnace Air Cleaner. With each cycle, it removes almost all airborne contaminants. The Furnace Air Cleaner works with your central heating or air conditioning system to automatically bring you cleaned and refreshed air you'll enjoy.

An improved high-speed, high voltage switching supply ensures that you get air which is thoroughly cleaned – something the allergy sufferer or computer owner will really appreciate. The power supply mounts on a cold air duct and automatically turns the filter on when the blower is running. The power supply will operate one filter and runs on 120 VAC, 60 Hz. Filters are available in four sizes and are required for use with the Air Cleaner. (Compatible with GD-2196.)

Kit GD-3196, Furnace Air Cleaner, Shpg. wt. 9 lbs. **149.95**
GDA-3196-1, Filter Accessory, 16" x 20," Shpg. wt. 5 lbs. **99.95**
GDA-3196-2, Filter Accessory, 16" x 25," Shpg. wt. 6 lbs. **99.95**
GDA-3196-3, Filter Accessory, 20" x 20," Shpg. wt. 6 lbs. **99.95**
GDA-3196-4, Filter Accessory, 20" x 25," Shpg. wt. 7 lbs. **99.95**

[2] Quickly remove dust, dirt, allergens and smoke

$269.95

- **Filters out 99% of pollen and 94% of harmful particles**
- **Three filters purify the air and remove unpleasant odors**
- **Efficient, three-speed fan makes air-cleaning jobs easy**

The Heathkit Portable Electronic Air Cleaner takes on your toughest air cleaning problems. Efficiently removes dust, dirt, smoke and other pollutants from 6,000 cubic feet – that's a 25' by 30' room with an 8' ceiling. Three speeds tackle a variety of jobs and three filters work together to keep your air clean and fresh. The power supply, 3-speed fan control and filter are preassembled. Uses 120 VAC, 60 Hz. 26½" H x 17¼" W x 13½" D. (Compatible with GD-2196.)

Kit GD-1297, Shpg. wt. 59 lbs. **269.95**
GDA-1297-2, Replacement Charcoal Filter, Shpg. wt. 2 lbs. **9.95**

[3] Economize with this sensitive Heat Sniffer

$24.95

- **Locate heat loss areas in your home**
- **Audible alarm and flashing LED alert you to heat leaks**

The hardest part of reducing heat loss in your home is finding those leaks. Now you can easily detect heat loss areas with the Heat Sniffer. Just turn the Heat Sniffer on and adjust it for silence. Then move the Sniffer's sensor along areas where heating/cooling losses might occur. Changes in temperature set off a beeping alarm and a flashing LED – alerting you to heat loss. The Heat Sniffer can be used in temperatures from 59°-95°F. Requires a 9-volt battery (not included).

Kit NE-2112, Shpg. wt. 2 lbs. **24.95**

[4] Sound-Activated Switch turns on lights for you

Provide extra safety in halls and on stairways with this handy device. The Sound-Activated Switch turns on lights for you and saves money by turning them off after you've gone. Sensitivity and turn-off delay are adjustable. Operates up to 300 watts of 120 VAC lights.

GDP-1270, Assembled, Shpg. wt. 1 lb. **19.95**

[5] Convenient Fingertip on/off control of lights

Remotely control TV's, lamps or appliances. Plug your lamp or appliance into the control unit which is plugged into an AC outlet, then connect the touch plate with an easily concealed wire. Place the touch plate anywhere for convenient ON/OFF control at your fingertips. Operates up to 300 watts of 120 VAC lights.

Kit GD-1287, Shpg. wt. 2 lbs. **21.95**

[6] Be alerted to damaging AC line variations

- **Monitor measures and displays AC line voltages between 90 and 135 VAC with a basic accuracy within ±1.5%**

The IM-2203 Line Voltage Monitor lets you know when brownout conditions exist on the AC line so you can safely shut down voltage sensitive equipment. This accurate instrument is extremely useful in displaying the line voltage of minicomputer, medical, or communications systems. A manually reset Fault Indicator can be set to light any time the AC drops below a user-adjusted voltage between 90 and 120 VAC. Compact 3.7" H x 5.5" W x 1.6" D case.

Kit IM-2203, Shpg. wt. 3 lbs. **59.95**

Make your telephones more versatile and easier to use at home or in the office

[7] Cordless portable telephone provides freedom

$119.95

- **Security system protects your line from unauthorized entry**
- **Select either pulse or tone dialing**

Take the handset of the Freedom Phone 750 and use it up to 1000 feet away from the base unit. Use pulse or tone dialing to access custom calling services. Other features include one-button automatic redial; separate mute button; digitally encoded security system; high/low volume control switch; and clear button. It operates on easily recharged nickel-cadmium batteries (included).

GDP-1342, Assembled, Shpg. wt. 3 lbs. **119.95**

California law requires the following statement: FCC-approved Freedom Phone 750 will be serviced under provisions outlined in the manufacturer's warranty.

[8] Save time and money with the Demon Dialer

$79.95

- **Automatically redial busy and unanswered number**
- **Accurately dial lengthy Alternate Long Distance numbers**
- **Expansion lets you store up to 176 seven digit numbers**

The memory stores 93 7-digit numbers 60 11-digit numbers or 55 23-digit numbers and this is nearly doubled with the Memory Expansion Accessory. Controlled by an on-board CPU, the Dialer instantly and automatically dials numbers of up to 32 digits stored under easy-to-remember 2- to 6-digit letter/number codes you devise. Two-key sequences will redial or 'Demon Dial' after the first try. The Dialer will silently dial a busy number 10 times in the 1st minute, once every 2 minutes for 10 minutes and once every 10 minutes for up to 2 hours. While it 'Demon Dials,' incoming calls can still be received and a success signal alerts you when the party being called answers. Operates with any telephone and extension phones with touch-tone service. Includes AC power cube, 3-volt backup battery, two cables with modular plugs, and series jack. 1⅝" H x 5⅞" D x 5⅛" W.

Kit GT-2217, Shpg. wt. 3 lbs. **79.95**
GTA-2217-1, Memory Expansion Accessory, Shpg. wt. 1 lb. **19.95**

[9] Instant one-number access dialer for any situation

$49.95

- **Stop dialing lengthy 13-digit phone and billing numbers**
- **Dial an emergency number by picking up the phone**

The HOTSHOT is a unique one-number telephone dialer that quickly dials any number up to 31 digits. End the aggravation of dialing a 13-digit number to access Alternate Long Distance service. The Dialer is great for credit card checking, automatic prefix dialing, WATS line entry, security, hotline applications, and instant dialing of emergency numbers. The easy-to-program memory doesn't require battery backup since it's mechanically programmed. Plugs into any standard touchtone modular phone jack with Y-adapter (included in kit).

Kit GT-2218, Shpg. wt. 2 lbs. **49.95**

[10] Replace phone bells with a Pleasant Phone Ringer

$29.95

- **Adjustable volume, connections for external speakers**
- **Easily installs between the phone and outlet**

Replace the dull ring of your phone. A musical IC in this one-evening kit offers four delightful alternatives: a beeping signal; an upbeat four-note chime; 10 seconds of Beethoven's "Fur Elise" or 20 seconds of "Romance."

Kit GT-1218, Shpg. wt. 1 lb. **29.95**

VISA MasterCard **Credit Card Orders Call TOLL-FREE: 800-253-0570. Alaska and Michigan Residents Call: 616-982-3411.**

Easy-to-install filter available in four sizes

Put some freshness into stale house air while removing dust and pollen

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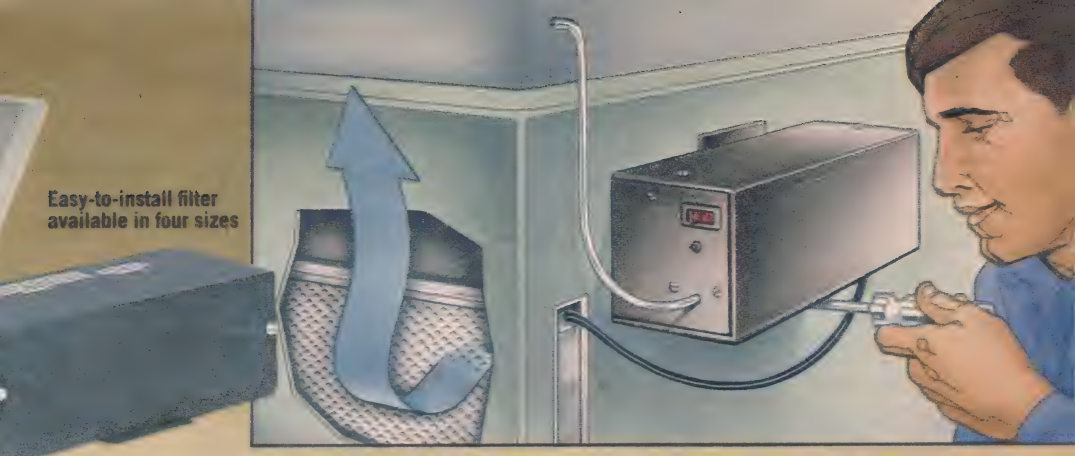

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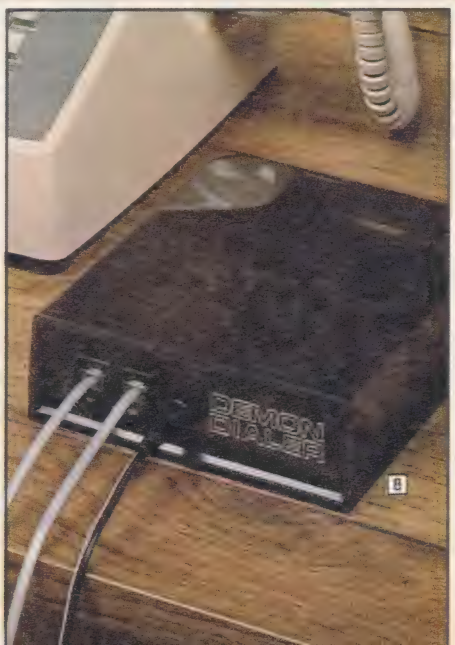

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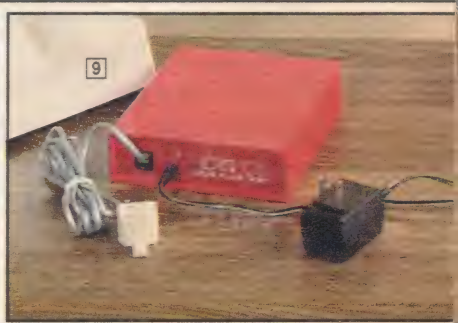

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10

Quality electronic tools and accessories to make your kitbuilding easier and a lot more fun

The right tool makes any job go easier. This can be especially true during kitbuilding, where the proper tool or utility can make a difference in the quality success of your finished product. That's why these tools and accessories are Heath-recommended for greater convenience and reliability every time you tackle a new project. Soon they will become the most used items on your workbench and you'll wonder how you did without them for so long!

1 Handy 25-watt soldering iron

With its 860-degree F ⅛-inch screwdriver tip, this professional pencil iron makes close soldering jobs cleaner and easier. Lightweight with rugged stainless steel barrel and long-life soldering tips. 120 VAC. (Color other than pictured.)

GDP-207, Shpg. wt. 1 lb. **16.95**

2 Weller soldering station for easier soldering

Automatically controls iron tip temperature at 700 degrees F. Comes with heat-shielded holder on a sturdy stand, pilot light and switch, 3-wire cord set, 6 foot power cord, 700-degree tip, tip storage tray and removable sponge.

GDP-1108, Assembled, Shpg. wt. 5 lbs. **89.95**

GDP-1109, Set of five 700 degree F assorted tips for above, 1 lb. **17.95**

3 See better, clearer, easier with illuminated magnifier

Illuminated magnifier, provides bright, cool light with an energy-conserving 22-watt circular fluorescent. Eye-strain is relieved by a distortion-free 2 to 1 magnifier with a 5" polished lens. Has enamel housing and 45" long-reach arm on 360° base. Clamps on any horizontal surface up to 2½" thick. UL listed. Color may vary.

GDP-200, Assembled, Shpg. wt. 7 lbs. **89.95**

4 Flexible extension lamp for light where you need it

Flexes over 360 degrees with a 32-inch reach. Rugged counter-balanced arm clamps in any position. Incandescent bulb is not included.

GDP-202, Shpg. wt. 4 lbs. **24.95**

5 PanaVise circuit board holder

Holds steady circuit boards up to 12" wide. Boards mount in spring-loaded arms that tilt 220 degrees and rotate 360 degrees. Does not include base.

GDP-1254, Shpg. wt. 2 lbs. **21.95**

6 PanaVise vacuum base

Holds firmly to surfaces. Rubber suction pad doesn't scratch mounting surface.

GDP-1252, Shpg. wt. 2 lbs. **21.95**

7 PanaVise standard vise head

If you've ever needed a third hand when assembling a circuit board or working on an electronics project, the GDP-1253 could be your answer. Nylon jaws open to a full 2½". This vise firmly grips even larger and heavier items.

GDP-1253, Shpg. wt. 2 lbs. **19.95**

8 PanaVise standard adapter base

Permanently mount this base on your workbench and use it with any standard (⅝" shaft) PanaVise fixture. An adjustable, special ball-joint permits positioning that board or chassis at the exact angle you need for ease and precision in your work.

GDP-1251, Shpg. wt. 2 lbs. **16.95**

9 PanaVise wide-opening holder

Make working on larger components easier. This vertical-opening vise will position and hold those items up to 9" in thickness, such as a chassis or cabinet. The Holder is easily mountable (if you prefer) and has replaceable jaw pads to ensure against possible damage to bulkier items.

GDP-1255, Shpg. wt. 2 lbs. ..... **Only 9.95**

10 Easily see small detailed circuits with magnifier

This magnifier fits comfortably on your head, freeing both hands for work, while it magnifies by 2½ times. Finely ground shatter- and scratch-resistant lenses. Lens holder flips out of the way and works well with eyeglasses. Focus view area is 8" to 14" below the optical-quality acrylic lens. Adjustable cushioned headband.

GDP-201. Assembled, Shpg. wt. 1 lb. **24.95**

11 Low-cost kitbuilder's tool set and soldering iron

This 11-piece kit is perfect for the beginner or the busy technician. Included in this tool set is a high-quality Weller 25-watt, 800-degree F soldering iron with two interchangeable tips, a soldering-aid tool, a 4 oz. spool of solder, wire strippers, diagonal cutters, 4" long-nose pliers, ¼" nut driver, and a regular and a phillips screwdriver. Durable 3" H x 10¾" W x 10" D carrying case has molded storage tray for all tools and a built-in carrying handle.

GHP-1270, Shpg. wt. 2 lbs. **42.95**

12 Smart Outlet Box with increased protection

Faster response and better suppression of power line surges and voltage spikes are added to the handy Smart Outlet Box. Power to six other (3-prong) sockets is switched on when a device plugged into the control socket is turned on. An eighth socket is unswitched for devices such as clocks. Control all equipment with one conveniently located switch. Control socket even allows a small amount of current to pass through it for equipment with digital clocks.

Kit GD-1495, Shpg. wt. 5 lbs. **59.95**

GDW-1495, Assembled and tested (UL Approved) Shpg. wt. 4 lbs. **99.95**

13 Power up with the multiple outlet junction box

Solves your problem of a shortage of electrical outlets. Has twelve 3-prong outlets, eleven are turned on from a switch while the other always has power to it. Fused 3-hole outlets have 10 amp. maximum load.

Kit HD-1274, Shpg. wt. 4 lbs. **24.95**

14 Dependable Deluxe Garage Door Opener ends strain and daily struggle with garage doors

$199.95

- **The easiest-to-install screw drive system available**
- **Door re-opens instantly if obstructed while closing**
- **Exclusive triple-thread drive system beats chain or belt-driven openers in long-life durability tests**
- **Powerful ⅓ horsepower motor opens doors easily**
- **Security light comes on when garage door is opened and remains on for five minutes after the door is closed**

Convenience and security are primary concerns for home-owners, Moore-O-Matic Garage Door Openers address both concerns – at a low price. Eliminate the need to fumble with a key-locked garage door and keep dry on your way to work and home – a security light sees you safely into the home.

The Electronic Command Garage Door Opener pays for itself in convenience and security. Touch the button on the remote transmitter and the door opens – 80 watts illuminate your garage. Touch the button again, the door closes and positively locks to prevent anyone from opening it from the outside by hand (the light blinks when the door is closing). The security-timed light will remain on for about five minutes to let you get safely inside the house.

Designed for garage doors up to 18 feet wide and 7 feet high, the powerful ⅓ horsepower motor opens garage doors effortlessly. A shock absorber cushions vibrations and allows for up to two inches of ice buildup or other impediments. Up-limit, down-limit and obstruction pressures are adjustable. In case of difficulty, the quick-release trolley disengages with a simple string tug. A second tug resets the trolley.

The solid-state transmitter and receiver use digitally encoded signals. You have 256 possible code combinations which you can set and change at anytime to eliminate interference from neighboring units. The electrical control circuits are conveniently contained on one removable circuit board, and run by an on-board microprocessor.

Electronic Command Opener System can usually be installed in a single day, with do-it-yourself ease and no special tools. Requires 120 VAC, 60 Hz. Very little assembly is required.

Transmitter, Receiver, Dual Switch and Screw-Drive Door Opener Mechanism.

GD-3509, Shpg. wt. 41 lbs., Motor Freight **199.95**

Use these to replace your remote control.

GDP-3309-A, Transmitter only, Shpg. wt. 1 lb. **29.95**

GDP-3319-A, One Transmitter, one Receiver for 3-wire system, 1 lb. **59.95**

GDP-3329-A, Two Transmitters, one Receiver for 3-wire system, 2 lbs. ... **89.95**

Power Transformer for adapting 2-wire Opener to 3-wire system.

GDA-3309-3, Shpg. wt. 1 lb. **12.95**

Use your Visa or MasterCard credit card to purchase your kit.

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TOOL KIT
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Heath transceivers and accessories are unbeatable values for novice or experienced hams

1 Get high performance at a low cost with Heathkit Synthesized HF/SSB/CW Transceiver

$549.95

- **PLL-synthesized stability with crystal accuracy**
- **Digital display with direct keypad frequency entry, two memories per band and mode/status symbols**

This kit-form rig breaks the cost-barrier to sophisticated, dependable equipment. The microprocessor-controlled HW-5400 gives quick-change versatility in adapting to uncertain band conditions – at home or in the field. Add new adventure to your Amateur Radio experience with Heath's HW-5400.

Three modes, eight bands and lots of power for HF excitement: It operates in USB, LSB, and CW on 80-10 meters with automatic sideband selection. Solid-state and broadbanded, it has QSK for proficient CW ops, sixteen memories, power supply activation at the panel and defeatable amp relay for quiet keying.

Beats the QRM every time: A tremendously versatile Split-Memory Access Function lets you review and change the transmit frequency while in receive with practically no information loss from the station in contact.

High resolution tuning employs an efficient dual-speed technique. Rapidly scan a band in 1 kHz increments, while tuning to pick out closely-packed calls for more QSOs over a narrow frequency range at 50 Hz per step. You also get total Transceiver status at a glance, including current mode, T/R status, split operation, split-access memory handling and if transmit frequency is outside the band edge. Just three knobs command signal isolation and maintenance.

Kit HW-5400, Transceiver, Shpg. wt. 24 lbs. ..... **Last Call 549.95**

Kit HWA-5400-1, Power Supply/Speaker/Digital Clock provides a well-regulated, 13.8 volt source of DC power. Shpg. wt. 39 lbs. **179.95**

Kit HWA-5400-3, Frequency Entry Keypad for instantly synthesized direct QSY, and fast DX, contest and net work using the Split Memory Function. Improve contact agility with this cursor-controlled, single-digit, random or sequential access to any frequency and 50 Hz PLL accuracy. Shpg. wt. 1 lb. **59.95**

Kit HWA-5400-2, Deluxe 2.1 kHz 4-Pole SSB Crystal Filter provides sharper skirt selectivity in the IF bandpass for ten total poles of filtering and optimum receiver performance. Shpg. wt. 1 lb. **59.95**

HW-5400 SPECIFICATIONS – GENERAL: Overall Band Coverage: 80 through 10 meters, 10 MHz WWV, WARC bands operational. **Frequency Coverage:** 3.450 – 4.050, 6.950 – 7.350, 10.000 – 10.200, 13.950 – 14.400, 18.018 – 18.218, 20.950 – 21.500, 24.840 – 25.040, 28.000 – 29.750 MHz. **Frequency Readout:** 7-digit vacuum fluorescent display with special symbols. **Readout Symbols:** – (Split), – (Out of band), L (LSB), U (USB), C (CW-Wide), C (CW Narrow), M (Memory), – (Transmit). **Readout Accuracy:** To nearest 50 Hz. **Frequency Control:** Synthesized. **Synthesized Lock Indicators:** Display reads 'PLL' and LEDs show which loops are unlocked. Transmitter is disabled. **Dual Rate Frequency Tuning:** Slow = 50 Hz per step, 1.25 kHz per knob rotation. Fast = 1 kHz per step, 25 kHz per knob rotation. **Tuning Backlash:** None. **Split Frequency Operation:** Transmit from memory frequency, receive from displayed frequency. **Memory:** Stores two frequencies per band. **Frequency Stability:** Less than 50 PPM drift from turn on. **Modes:** SSB Normal and Reverse; CW, Wide or Narrow. **Operating Temperature:** 0° to 40°C. **Power Requirements:** 11 to 16 VDC, 120/240 VAC with optional AC power supply. All specifications referenced to 13.8 VDC. **RECEIVER: Sensitivity:** Less than 0.35 μV for 10 dB, S+N/N. **Selectivity:** With standard filter, 2.0 kHz minimum at 6 dB to 6 kHz maximum at 60 dB; with HWA-5400-2 optional filter, 1.8 kHz minimum at 6 dB; CW active audio filter, 250 Hz minimum at 6 dB centered at 700 Hz. **Overall Gain:** Less than 1 μV for 0.25 watt audio output. **Audio Output:** 2 watts minimum into 4 ohms; less than 10% THD. **AGC:** Selectable Fast or Slow (no more than 8 dB audio change for a 100 dB or greater input signal range). **Intermodulation Distortion:** 70 dB minimum at 25 kHz. **Image Rejection:** 80 dB minimum. **IF Rejection:** 100 dB minimum. **IF Shift Tuning:** ±600 Hz in Receive only. **Internally Generated Noise:** All below 1.0 μV. **Audio Hum and Noise:** Greater than 40 dB below maximum output. **Receiver Incremental Tuning:** ±350 Hz. **TRANSMITTER: RF Output:** High SSB, 100 watts PEP power minimum, except 80 watts on 10 meters. CW, 100 watts minimum, except 80 watts on 10 meters. **Duty Cycle:** Continuous SSB (voice). 50% receive-transmit ratio on CW; 5 min. on, 5 min. off. **Load Impedance:** At least 90% rated power with less than 2:1 SWR. Protected against high VSWR. **Carrier Suppression:** –50 dB minimum from a 100 watt, single-tone (1000 Hz). **Unwanted Sideband Suppression:** –50 dB minimum from a 100 watt, single-tone (1000 Hz). **Spurious Radiation:** –60 dB minimum, referenced to 100-watt output. **Third Order Distortion:** –30 dB minimum from a 100 watt PEP two-tone output. **T/R Operation:** SSB = PTT or VOX, CW = full break-in (simplex only). **CW Sidetone:** 700 Hz to speaker or headphones. **Microphone Input:** High impedance (25k ohm) with –55 dBm rating. **Operation with External Linear Amplifier:** Linear relay, linear ALC rear panel connections. **Front Panel Meter:** Automatically-switched S-units in Receive, ALC in Transmit. **Cabinet Dimensions:** 4¼" H x 11¼" W x 14" D (10.8 x 28.6 x 35.6 cm). **Weight:** 24 lbs. (10.9 kg).

HWA-5400-1 SPECIFICATIONS: Line Voltage: 120/240 VAC, 50/60 Hz. **Output Voltage:** 13.8 VDC at rated load. Protection: 20-ampere DC output fuse. 7- and 4-ampere slow blow fuses for 120 and 240 VAC primaries, respectively. **Output Current:** As required by Transceiver, up to 18 (20 peak) amperes during transmit. **DC Output Regulation:** 7% from receiver load to transmit load at 120 VAC primary; 4% additional with AC primary at 110-130 or 220-260 VAC. **Ripple:** 50 mV or less at rated load. **Duty Cycle:** 9 amperes DC continuous. 18 amperes at 50% (5 min. on, 5 off). **Speaker:** 4 ohms impedance, 300-3000 Hz response, 2 watts peak power. **Clock:** 4-digit blue fluorescent display in 12 or 24 hour format, synchronized to line frequency. **Cabinet Dimensions:** 4¼" H x 8½" W x 14" D (10.8 x 21.6 x 35.6 cm).

2 Observe your signal with this Station Monitor

$249.95

- **Ensure the purity and stability of your transmissions**
- **Add the Pan Adapter Module to see where other signals are on the band in relationship to your tuned frequency**

Continuously monitor your signals with the HO-5404 Station Monitor which displays SSB, TRAP, or RTTY. Also use the Monitor with a receiver to view audio signals from other stations, or as an oscilloscope for testing. Solve many common problems such as improper alignment or tuning, insufficient or excessive drive, poor carrier or sideband suppression, regeneration, parasitics, and CW key clicks.

For testing, the Station Monitor displays audio signals from 10 Hz to 40 kHz with good sync capability and high input sensitivity. The HO-5404 also has a 10:1 vertical and horizontal input switch attenuator, with constant input impedance regardless of switch position.

For DX chasing add the HOA-5404-1 Pan Adapter Module board to view other signals within ±20 kHz or ±100 kHz from the frequency. The HOA-5404-1 works with receivers with IFs of 3.395 MHz and 8.83 MHz.

Kit HO-5404, Shpg. wt. 13 lbs. **249.95**

Kit HOA-5404-1, Shpg. wt. 2 lbs. **99.95**

HO-5404 SPECIFICATIONS: RF SAMPLING SECTION: Frequency Coverage: 80 through 6 meters (3.5-54 MHz). **Sensitivity:** ¼" vertical deflection at 10 watts, ¾" vertical deflection at 100 watts. **RF Power Limits:** Exciter Input (50-75Ω) 10 to 300 watts, Antenna Input (50-75Ω) 10 to 1000 watts. **Insertion Loss:** Negligible. **VERTICAL AND HORIZONTAL AMPLIFIERS: Input Impedance:** Vertical; 1MΩ shunted by 125 pF. Horizontal; 1 MΩ shunted by 160 pF. **Sensitivity:** 60 mV per ¼" vertical deflection. **Attenuator:** 2-position switch; X1: 1 V RMS maximum, X10: 10 V RMS maximum. **Frequency Response:** Vertical; 10 Hz to 40 kHz typical. Horizontal; 10 Hz to 300 kHz typical. **SWEEP GENERATOR: Type:** Recurrent, automatic sync. **Frequency Range:** 10 Hz to 10 kHz in three steps. **GENERAL: CRT:** 3RP1A; flat face; green, medium-persistence phosphor. **Graticule:** ¼" squares; 6 x 8 (1.5" x 2" viewing area). **Power Supplies:** Solid-state rectifiers, regulated amplifier supplies. **Power Requirements:** 110-130 VAC, 60 Hz, 22 watts. **DIMENSIONS:** 11¼" W x 12⅛" D x 13⅜" H. **NET WEIGHT:** 10.6 lbs.

3 Heath's HW-99 Novice CW Transceiver is the ideal radio for the new Amateur Radio operator

$299.95

- **Broadband circuits cover the first 250 kHz of the 80, 40, 15 and 10 meter bands**
- **RF power output of 50 watts on all bands except 10 meter which is 40 watts.**

Get off to a good start in Amateur Radio with the HW-99 Novice CW Transceiver. You will continue to enjoy it long after advancing beyond the novice level. Power, quality features and affordability make this durable transceiver an unusually good investment.

To give you the best possible novice CW transceiver we have combined many of the quality features found on the HW-9 Deluxe QRP CW Transceiver with plenty of power for easy contact. Broadband design ends the need to tune circuits within the band. The wide-band front-end uses a 4-pole crystal filter to handle wide dynamic range signals with ease and eliminate the usual RF amplifier. You get superior performance with AGC circuits.

Use of single frequency conversion in the main signal path reduces spurious responses and maintains superior image rejection. The HW-99 also has a balanced product detector and an active-audio filter. The power amplifier is VSWR protected. A front panel bar display indicates relative signal strength in receive and relative power in transmit. The solid-state, compact Novice CW Transceiver has a built-in AC power supply and operates on 120 VAC at 60 Hz. The unit measures 11½" W x 10¾" D x 4⅝" H.

Kit HW-99, Shpg. wt. 20 lbs. **299.95**

4 **The Heathkit SP-99 Station Speaker** is a 3" communications receiver speaker in an attractive cabinet designed to match the HW-9 and HW-99. The unit measures 4½" W x 6¾" D x 8" H.

Kit SP-99, Shpg. wt. 3 lbs. **29.95**

HW-99 SPECIFICATIONS: TRANSMITTER: RF output power: 50 watts, except 40 watts on 10 meters. **Transmitter Frequency Offset:** App. 700 Hz. **Antenna Load Impedance:** 50 ohms unbalanced nominal. **Harmonic and Spurious Radiation:** –40 dB minimum at rated output. **T/R Operation:** CW, full break-in to 30 WPM. **RECEIVER: Sensitivity:** less than 1.0 μV for 10 dB S+N/N. **Selectivity:** App. 450 Hz at 6 dB. **Dynamic Range:** 70 dB. **Image and IF Rejection:** 50 dB minimum. **Audio Hum Noise:** –40 dB. **Audio Output:** 1 watt into 8-ohm load. **GENERAL: Frequency Stability:** Less than 200 Hz/hr drift after 30-minute warmup. **Power Requirement:** 120 VAC at 60 Hz. **Dimensions:** 11½" W x 10¾" D x 4⅝" H.

VISA MasterCard **Credit Card Orders Call TOLL-FREE: 800-253-0570. Alaska and Michigan Residents Call: 616-982-3411.**

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Monitor your own and other signals

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SPECIAL OFFER FOR NOVICES

Receive a $100 gift certificate when you mail Heath Company a photocopy of your license and the HW-99 Novice CW Transceiver registration card. The $100 gift certificate may be used on any Heathkit product.

[1] Be part of exciting packet radio and save $50

$199.95 **We bring you the HD-4040 Terminal Node Controller, representing the newest frontier of Amateur Radio: terminal control and packet transmission. It opens your station up to error-free, high speed communication with almost no interference from others on the channel. And greatly increases your range by allowing relay of transmissions through up to eight stations. You get the best in packet radio equipment with the Heath TNC, the only RFI approved, FCC certified controller available.**

Error-free communication even under adverse band conditions, is yours with the HD-4040. This packet radio interface provides terminal control of your existing equipment and allows data to be sent and received as packets of digital information. This not only greatly speeds the transfer of data but ensures error-free transfer. Each burst of information, or packet, is automatically checked by the HD-4040 and will not be accepted until it is correctly received. When sending, the TNC repeats the transmission until it is acknowledged as correctly received. All this is done automatically by the HD-4040, you just type in your messages with the keyboard. The TNC acts as a teletypewriter so all communication is printed on your monitor. The HD-4040 and packet radio free you to concentrate on communicating, instead of worrying about QRM or missing information.

Most packet radio operates at 1200 baud and can run much faster. Since packet radio operates in bursts many users can operate on the same frequency at the same time.And you can use the same frequency for both calling and working channels. The HD-4040 automatically monitors the channel and relays information only when the channel is open. You notice only a slight delay on heavily loaded channels. Three modes of operation: A conversation mode lets you converse with another operator; a command mode configures the TNC and allows use of a variety of operating commands; a transparent mode is used in computer file transfer. The HD-4040 uses AX.25 and VADCG protocols.

Automatic beacon and digital repeater add unique capabilities to Amateur Radio. The automatic beacon transmits your call letters and a message at the time intervals you set. The automatic digital repeater lets you relay transmissions from one operator to another – greatly extending the range of your equipment by relaying through up to eight intermediate stations. As long as power is supplied to the TNC it will act as a beacon and digital repeater – even if you are conversing with another operator or have turned off your computer or terminal. The TNC can store up to 2K of activity in memory, so you can receive messages while not at your station. You can also set the TNC to recognize only the calls you wish to receive.

A 6809 processor, at 32K ROM and 8K RAM are featured. The RAM or ROM can be expanded by adding up to 16K. Operating commands are stored in a two-band non-volatile RAM which does not require battery backup. A built-in modem interfaces the TNC to your transceiver. This modem is capable of baud rates up to 1200 and filters input prior to demodulation. Filter constants are hardware selectable. Plug in an external modem and achieve baud rates up to 19,600 (with selectable clock) on UHF. Baud rate for either internal or external modem is adjustable through the keyboard. A header kit for 1200 baud operation is included. Ports include serial port for RS-232C terminal or computer interface for baud rates from 50 to 4,800 (optionally to 19,200), and parallel port for TNC status, command channel and diagnostic signal.

No programming knowledge required. You need only the HD-4040, a terminal (p. 102-103) or computer with terminal emulation software (p. 92-93) and RS-232C cable. Technician or above licensing required.

New WA8DED TNC Firmware adds exciting capabilities to the HD-4040. It permits multiple connects, recognizes both versions 1 and 2 of AX.25 protocol and features auto-disconnect. This public domain firmware is available on COMPUSERVE and other popular computer networks or send a copy of your HD-4040 invoice and we will supply a free set of EPROM's and WA8DED documentation.

Kit HDS-4040-3, HD-4040 with FREE HDA-4040-1 and HDA-4040-2 Shpg. wt. 14 lbs. ..... **Was $249.95 Now 199.95**

Kit HDA-4040-1, TNC Status Indicator. 8 LED's report state of connect, mode buffer, frame error. Generates tone when connect is initiated. 2 lbs. **24.95**

Kit HDA-4040-2, Flat Filter Option, 1 lb. **9.95**

$AVER! Save $33.00 with kit HDS-4040-T, includes HD-4040, HDA-4040-1, HDA-4040-2, HTX-10 terminal less monitor and modem, and interface cable, Shpg. wt. 37 lbs. **499.95**

$AVER! Save $53.00 with kit HDS-4040-TM, includes HD-4040, HDA-4040-1, HDA-4040-2, HTX-10 terminal with ZVM-122A monitor less modem, and interface cable, Shpg. wt. 62 lbs. **599.95**

HD-4040 SPECIFICATIONS: Processor: 6809. **Clocks:** 7.3728 MHz crystal oscillator for UART, switched capacitor filter, and E & Q systems. **Memory:** ROM, 32K (expandable to 48K), RAM, 8K (expandable to 24K). **Serial Port:** RS-232C interface to terminal or computer. Baud rates 50 to 1200 (optional to 4800). **Parallel Port:** Controller status and command channel and diagnostic signal port. **Non-volatile RAM:** 128 4-bit locations. **Protocols:** AX.25, VADCG: **Power:** 120V, 15 watts. **Dimensions:** 13⅝" x 7¾" D x 2⅜" H.

SUPER $AVER $50 OFF! Buy both the HD-4040 Terminal Node Controller and the 2-Meter Handheld Transceiver, then subtract $50 from the total.

2-M Handheld adapts to any situation – even mobile use

$279.95 **Handheld**

- **Slip the handheld onto your belt and attach the mic to your collar for hands-free operation, hop in the car and slip the unit into the mobile mount for mobile operation**
- **Optional microphone/speaker has touchtone keypad**
- **Built-in CTCSS encoder, RF attenuator, Receiving Signal Strength/Battery meter and three power settings**
- **Included NiCd battery pack charges in just 4 to 6 hours**

For true versatility you can't beat this functional handheld/mobile system. It gives you hands-free, handheld or mobile operation with one unit and a few accessories. For full-powered mobile operation you just slip the handheld in to the mobile console. This system makes communication flexible and keeps your costs low.

This handheld has it all: built-in CTCSS encoder; S/BATT meter, selectable 5 W, 1.5 W and 200 mW RF power outputs; squelch control, and thumbwheel channel selector switches with + 5 kHz switch. Plus, tone and ± 600 kHz repeater offset switches and lamp switch for illumination of the S/BATT meter and switches. Frequency range is 144 MHz to 147.995 MHz in 5 KHz steps and sensitivity is 0.25 μV the included NiCd rechargeable battery pack slides over the base of the handheld and charges in only 4 to 6 hours. The optional microphone/speaker with touchtone 16-key keypad plugs into both the handheld and into the Console.

Put the handheld in the Mobile Console for 25-watt mobile operation. The Console has Power, UHF and VHF switches, and lit frequency display. RF output impedance is 50 ohms. The Console has provisions for the HWA-6502-1 25 watt 2M Amplifier. 21/4" H x 6½" W x 8½" D (excluding projection).

[2] **HW-6502,** 2M Handheld, NiCd battery, antenna, belt clip, 3 lbs. .. **279.95**

HWA-6502-1,* 25-watt 2-M Amplifier, Shpg. wt. 1 lb. **59.95**

[3] **HWA-6502-2,** Mobile Console, Shpg. wt. 4 lbs. **129.95**

HWA-6502-3, Speaker/Microphone with keypad, Shpg. wt. 1 lb. **39.95**

HWA-6502-4, Accessory Pack includes 12 VDC Mobile Charger and Dry Battery Tray, Shpg. wt. 1 lb. **19.95**

***This device has not been apaproved by the Federal Communications Commission. It is not, and may not be, offered for sale or lease, or sold or leased until the approval of the FCC has been obtained.**

[4] SW-7800 Shortwave Synthesized Receiver

$299.95

- **Five-digit LED display provides 1 kHz frequency accuracy**
- **Lower Sideband, Upper Sideband, CW and AM (wide and narrow) modes of operation**
- **Excellent sensitivity and selectivity for clean signals**

The SW-7800 covers 150 kHz through 30 MHz continuously in 30 over-lapping, 1 MHz bands. Broadband front-end circuits eliminate the need to tune circuits with a band. The design of the wide-band front-end stages eliminates the need for the customary RF amplifier. This results in a receiver that can properly handle incoming signals within a wide dynamic range. An up-converting, double-conversion mixing design provides excellent image rejection.

Plus other features you'll appreciate: AGC time-constant switch. Muting provision to allow operation with a transmitter. Local/DX switch to protect against overload from very strong local stations. Front panel jack for taping received material – unaffected by volume control setting. Telescoping whip antenna for local reception and portable operation. Mobile operation is possible using any 11 to 15 volt DC source at ¾ amp. Only a VTVM is required for receiver alignment.

Kit SW-7800, Shpg. wt. 12 lbs. **299.95**

High-performance trapped dipole antenna for use with any general coverage or shortwave receiver. Eight high-Q parallel-tuned traps reduce length and isolate various segments of the antenna for full coverage of the 11, 13, 16, 19, 25, 31, 41, 49 and 60 meter bands.

HDP-7800, Shpg. wt. 3 lbs. **64.95**

SW-7800 SPECIFICATIONS: GENERAL: Frequency Coverage: 150 kHz to 30 MHz in thirty 1 MHz ranges. **Readout Accuracy:** Nearest 1 kHz. **Frequency Control:** Synthesized (PLL and LC VFO). **Modes:** USB, LSB, CW and AM (wide or narrow). **Sensitivity:** SSB/CW, less than 0.35 μV for 10 dB (S + N)/N; AM, less than 2.5 μV for 10 dB (S + N)/N. **Selectivity:** SSB/CW, 2.5 kHz min. at 6 dB; AM, 5.5 kHz min. at 6 dB. **Selectivity Shape Factor:** 1.5 at 6/50 dB. **Image Rejection:** 55 dB min. **OTHER: Antenna:** Built-in telescoping whip. Connection for 50 ohm, unbalanced, external antenna (SO239) and high-impedance wire. **Audio Output:** Internal speaker, jack for headphone or external speaker. **Muting:** External jack for use with transmitter. **Recorder Output:** Miniature phone jack. **Power Requirements:** 120 VAC, internally; 13.8 VDC at ¾-ampere, externally. **Dimensions:** 11½" W x 10½" D x 4⅝" H.

VISA MasterCard **Discover the fun of kitbuilding at your Heath/Zenith Computers & Electronics Center.**

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NEW

Have complete communication anywhere with both mobile and handheld operation with tone dialing capabilities.

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Slip handheld into the Console for mobile operations

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5 The HW-9 Deluxe QRP CW Transceiver gives you the performance of a more expensive model

$199.95

- **Covers CW in 80, 40, 20 and 15 meter bands – expandable to 30, 17, 12 and 10 meter bands**
- **Front panel relative signal/power strength meter**
- **Continuously variable RF output, up to 4 watts**
- **Receiver Incremental Tuning for more versatility**

Superior design of the transmitter and receiver section sets this transceiver apart from other low-priced transceivers. The HW-9's state-of-the-art performance will be appreciated by avid QRP operators, newcomers and old timers alike. Microelectronic circuits reduce transceiver weight, while providing a level of performance and features unexpected at this price. Among these features are: broadband design, wide dynamic range, AGC, single conversion, product detector, active audio filter and RIT.

Broadband design eliminates the need to tune circuits within a band. The wideband front-end uses a double balanced mixer and 4-pole crystal filter to handle wide dynamic range signals with ease. This eliminates the need for the customary RF amplifier in the receiver section. You also get superior performance through the use of AGC circuits.

A single conversion in the main signal path reduces annoying spurious responses and maintains high-quality image rejection. Signals are pulled through the sensitive front-end with ease.

A balanced product detector followed by an active audio filter provides excellent performance. RIT (receiver incremental tuning) permits you to tune the receiver 1 kHz above or below the transmit frequency.

Full break-in operation is permitted by solid-state transmit/receive switching. Other features include continuously variable RF power output, and a front panel meter that indicates signal strength in receive and relative output in transmit.

Expand the transmission and reception capabilities from four to eight bands with HWA-9 Accessory Band Pack. It allows the HW-9 to cover the 30, 17, and 12 meter WARC bands and the lower 250 kHz of the 10 meter band. This gives you full coverage on all the amateur bands from 80 through 10 meters.

Rugged and lightweight, the HW-9 is ideal for portable operation. The Transceiver can be powered from batteries, a lighter socket, solar photovoltaic array or by 120 VAC 50/60 Hz with the PSA-9 Power Supply below.

Kit HW-9, Shpg. wt. 8 lbs. ..... **Only 199.95**
Kit HWA-9, Accessory Band Pack, Shpg. wt. 1 lb. ..... **Now 29.95**
Kit PSA-9, Accessory Power Supply, Shpg. wt. 4 lbs. ..... **Now 19.95**

HW-9 SPECIFICATIONS: TRANSMITTER: RF Output Power: 4 watts, except 3 watts on 10 meters. **Transmitter Frequency Offset:** App. 700 Hz. **Antenna Load Impedance:** At least 90% of rated power with less than 2:1 SWR. Protected against high SWR. **Harmonic & Spurious Radiation:** −35 dB & −40 dB minimum, at rated output. **T/R Operation:** CW, full break-in. **RECEIVER: Sensitivity:** 0.2 μV for readable signal; 0.5 μV or less for 10 dB S + N/N. **Selectivity:** Wide, 1 kHz max. @ 6 dB; Narrow, 250 Hz @ 6 dB. **Dynamic Range:** 85 dB. **Image & IF Rejection:** 60 dB, min. **Audio Hum Noise:** −60 dB. **Audio Output:** 1 watt into 8Ω. **GENERAL: Frequency Stability:** Less than 150 Hz/hour drift after 30-minute warmup. **Power Requirement:** 11-16 VDC, 12.6 specified. **Dimensions:** 4¼" H x 9¼" W x 8½" D.

Matching Wattmeter and Antenna Tuner

6 HF/VHF Wattmeter with 3:1 SWR bridge

- **Wire for three different frequency ranges**
- **Two power ranges, 0-5 and 0-50 watts**

Put your best signal on the air with confidence and keep your low-watt HF or UHF station at peak power efficiency with the responsive HM-9 Wattmeter. It simplifies continuous metering of exciter or amplified output level and gives you a quick, exact SWR readout to fine-tune your antenna system.

An exclusive Heathkit option lets you wire the HM-9 for monitoring in three different ranges: 1.8-30, 50-54 or 144-148, MHz. QRP *fans will love it.* Active hams on the 2- and 6-meter VHF bands can use it to measure output of their barefoot and boosted HTs, mobile or base transceivers.

Kit HM-9, Shpg. wt. 3 lbs. ..... **Only 39.95**

7 50-Watt Antenna Tuner with 4:1 balun

- **100% transmatch to a wide range of output impedance and almost unlimited matching capability between 1.8 and 30 MHz**

The HFT-9 provides an exact, 100% transmatch to a wide range of output impedances, with a built-in 4:1 ferrite balun. Connectors for coaxial feed, balanced line and long-wire antennas. A large 12-tap, air-wound inductor with silver-plated wire and tap switch gives you an almost unlimited matching capability between 1.8 and 30 MHz. Continuously variable transmitter/antenna controls make optimum adjustments easy.

Kit HFT-9, Shpg. wt. 3 lbs. ..... **Only 49.95**

$AVER! **Save by buying a system.** The matching wattmeter and antenna tuner system work together to improve your power efficiency, QRP signal and transmatch.

Kit QRS-9, HM-9 HF/VHF Wattmeter and the HFT-9 50-watt Antenna Tuner. Shpg. wt. 14 lbs. ..... **Only 84.95**

1 μMatic Memory Keyer started a revolution in CW

- **Adds programmable excellence to all your CW**
- **Ten variable length buffers for up to 240 characters of text**
- **Four-level random practice mode has 6,400 different 3,000-character code copy training sessions**

Patented "command strings" let you store text in the buffers, select the speed, weight, spacing or message repeat count for each one, and link them together in any sequence you desire. A special editing feature lets you recover from errors. Enter text at whatever speed and weight are comfortable for you, and send them with any other setting you wish. Text can be added into a buffer message being sent. CMOS memory with battery backup retains the buffer contents, last-selected speed, spacing, weight and repeat count when the Keyer is without power.

Kit SA-5010A, Shpg. wt. 3 lbs. **99.95**

PS-5012, 120 VAC Power Adapter Cube, 1 lb. **15.95**

SA-5010A SPECIFICATIONS: Speed Range: 1 to 99 wpm. **Character/Word Spacing:** Less than or equal to speed setting. **Number of Buffers:** 1 to 10. May be used to store text or commands. **Buffer Size:** 240 characters plus commands, total. **Weighting:** Normal plus 5 light and 5 heavy settings. **Auto Message Repeat:** 0 to 9 (sent 1 to 10 times). **Keyer Output:** Solid state: +250 volts @ 100 mA; −200 volts @ 40 mA. **Memory Backup:** Three 1.5-volt alkaline batteries (included) – 1 year typical life. (No battery drain unless Keyer is removed from AC power source). **Sidetone:** Approximately 300 to 1500 Hz, adjustable. **Power Requirements:** External transformer (optional) or 11 to 16 VDC @ 200 mA. **Dimensions (excluding paddles):** 1⅝" H x 4⅛" W x 6" D.

2 HD-1418 multi-mode SSB/CW/TTY Active Audio Filter makes the tough ones easy to copy

Twelve total poles of filtering can be combined to work as SSB & Notch, CW, CW2, SSB & Peak, RTTY and fixed configurations with razor-sharp skirts. Solve such problems as partially overlapped sideband signals, overmodulation splatter, close-packed CW stations, full RTTY reception through heavy interference, heterodyne whistle and noise. Versatile power requirements make this Filter usable almost anywhere. Just supply 7-13.5 volts AC or 9-18 volts DC.

Kit HD-1418, Shpg. wt. 3 lbs. ..... **Was $99.95 Now Only 79.95**

PS-5012, 120 VAC Power Adapter Cube, 1 lb. **15.95**

3 HD-1986 Microlizer tailors your microphone for optimum voice clarity and maximum talk-power on SSB

- **Obtain maximum SB output with clearer sounding signal**
- **Variable high and low response and audio gain adjust**

One of the greatest needs in Amateur Radio is to improve the quality of transmitted speech. In the shack, a poor microphone or just the pitch of a speaker's voice can make SSB transmission difficult to understand. And in mobile operation, peaks at the lower end of the voice range are common and frequently obscure clarity.

The Heathkit HD-1986 Microlizer lets you optimize the clarity of your voice transmissions and get a better match between your microphone and transceiver. Make sure you're heard – clearly. This microphone equalizer fits in series using a standard 4-pin microphone jack and ¼" phone output jack. Continuously variable high and low frequency controls provide a 12 dB boost or cut at 490 Hz and 2800 Hz. Increase or decrease over-all gain of the microphone signal you feed to your transceiver for more efficient and cleaner operation. Battery power eliminates the need of another AC outlet. When the Microlizer is on, the front panel LED will light briefly to let you know the battery is still good. Turn the power switch to off, and the Microlizer is bypassed to provide a direct connection between microphone and transceiver. Requires a 9-volt battery.

Kit HD-1986, Shpg. wt. 2 lbs. ..... **Was $44.95 Now Only 39.95**

HD-1986 SPECIFICATIONS: Adjustable Microphone Gain: Low Frequency Response: ±12 dB at 490 Hz; **High Frequency Response:** ±12 dB at 2800. **Input Impedance:** 100 k normal. **Maximum Input Level:** 500 mV RMS. **Frequency Response:** 200 Hz to 10 kHz. **Distortion:** 0.5% or less. **Power Requirement:** 9-volt transistor battery. **Dimensions:** 5¾" W x 2" H x 4½" D.

4 SA-2060A Deluxe Antenna Tuner with dual wattmeter/SWR bridge matches 1.8-30 MHz

$269.95

- **Covers 160-10 meter bands with continuous tuning**
- **Eliminates the loss of precious, mismatched power**
- **Select coaxial antenna, long-wire feed or bypass**
- **Constructed to minimize RF loss at high frequencies**

Touchy solid-state finals can rob you of precious bandwidth. The SA-2060A Deluxe Antenna Tuner can solve that problem by exactly matching an antenna to your transmitter at any frequency in the 160-10 meter HF spectrum, including MARS frequencies and the recently approved new band allocations. Bypass for your tri-band beam or dummy load, or select either of two coax outputs. Connect unbalanced feedlines or long wire antennas – a built-in 4:1 balun lets you use balance feedlines. A convenient front panel counter permits quickly setting the continuously-variable inductor to previously calibrated frequencies.

Dual wattmeters read forward and reflected power simultaneously for more efficient low band operation. The built-in wattmeter installs directly into transmission line to measure power on all frequencies between 1.8 and 30 MHz. Measures output up to 200/2000 watts in the forward direction and up to 50/500 watts reflected with a forward accuracy of ±5%. Silver-plated straps and roller contact assembly minimize RF loss at high frequency operation. Large feed-through insulators withstand high-voltage RF. Handles power inputs up to 2000 watts PEP on SSB and 1000 watts CW.

Kit SA-2060A, Shpg. wt. 20 lbs. **269.95**

SA-2060A SPECIFICATIONS: Frequency Coverage: Continuous coverage, 1.8 to 30 MHz. **Input Impedance:** 50 at match. **Impedance Transformation:** 4:1 balun. **Output Impedance:** Wide range. **Insertion SWR:** Less than 1.1:1. **Power Input Capacity:** Full legal limit. **Dimensions:** 5¾" H x 14½" W x 13⅞" D.

5 Remotely control receiver, autopatch, repeater

$79.95

- **Touch Tone Decoder lets you hear only the messages meant for you – eliminating extraneous monitor racket**
- **Also use HD-1530 to control repeater or autopatch ON/OFF**

Connect the Touch Tone Decoder in series with your receiver or scanner speaker. Turn it on and it mutes the receiver speaker until it detects the unique DTMF code which you have programmed in. In addition, use the HD-1530 for operation of single functions in the control of a repeater, or as a secondary control link for autopatch. Create the code from any three or four different characters found on a standard 12- or 16-character touch tone keypad. Sending the wrong code or taking longer than the selectable 3 to 26 second entry time causes the Decoder to reset. Set the unit to open the line for any time length between 25 seconds and 8 minutes, or the user can enter a two-digit code to open and close the line at will.

Kit HD-1530, Shpg. wt. 2 lbs. **79.95**

6 Save $50 on the Heathkit Automatic Antenna Tuner

- **Continuously variable inductor optimizes efficiency**
- **Preset the roller induction for two frequencies on each of nine bands**

Preset the roller inductor for 18 different frequencies – a high and low on each of the nine bands. In the Auto mode, just select the band and the high or low position; the Auto-Tune Antenna Tuner will set the roller inductor to the preselected value and adjust the transmitter and antenna capacitors. Remote operation lets you automatically tune selected frequencies using only transmitter band switches if your transmitter's equipped for remote operation.

Manual tuning is made easy with three front panel lever switches and dual wattmeters. The wattmeters read forward and reflected average power and SWR in two ranges. An auto-range circuit automatically switches the wattmeters.

Effectively tune and match unbalanced feed lines and single-wire antennas at the full legal power limit of your station. Add the 4:1 Balun Accessory for use with balanced ladder line antennas. Use the front panel coax switch to easily select from three different, permanently connected antennas and bypass.

Heath's Auto-Tune Antenna Tuner installs directly into the transmission line to measure power on all frequencies between 1.8 and 30 MHz-200/2000 watts in the forward direction and 50/500 watts reflected. SWR readings on the reflected meter provide direct readings from 1:1 to 3:1. Silver-plated straps and roller contact assembly minimize losses at high frequencies. Large feed-through insulators withstand high-voltage RF. Front panel indicators let you know complete Tuner status, including when the tuned SWR exceeds the selected ratio.

Kit SA-2500, Shpg. wt. 26 lbs. ..... **Was $399.95 Now Only 349.95**

Kit SA-2500-1, 4:1 Balun Accessory, 2 lbs. **39.95**

SA-2500 SPECIFICATIONS: Frequency Range: 1.8 to 30 MHz. **Input Power Capability:** 2000 watts, SSB; 1000 watts, CW. **Input Impedance:** 50Ω. **Output Impedance:** Wide range. **Impedance Transformation:** Optional 4:1 Balun. **Meter Functions:** Forward, reflected, average power, SWR. **Meter Ranges:** Forward, 200/2000 watts; reflected, 50/500 watts and 1:1 to 3:1 SWR. **Wattmeter Accuracy:** 200, 2000 watts forward, 500 watts reflected, ±5% average; 50 watts reflected, ±7.5% average. **Autorange Wattmeter:** User selected. **Insertion SWR:** Less than 1.1:1. **Automatic Tune:** Cycle time, about 15 seconds; input power, 20 watts min. for SWR Set; VWSR, user selected. **Power:** 120 VAC 50/60 Hz @ .25 amps max., internal; 12 VDC at 1 amp. max., external. **Dimensions:** 14½" W x 20" D x 6¾" H.

VISA MasterCard **Credit Card Orders Call TOLL-FREE: 800-253-0570. Alaska and Michigan Residents Call: 616-982-3411.**

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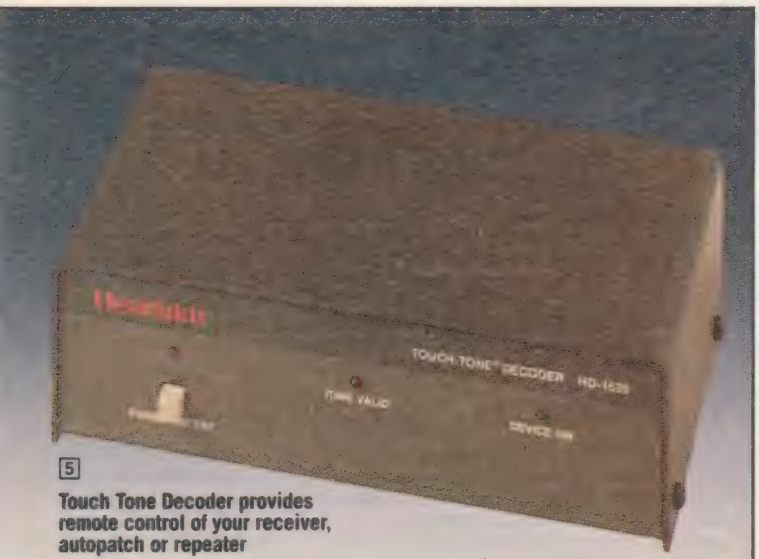


5

Touch Tone Decoder provides remote control of your receiver, autopatch or repeater

6

Heathkit's reliable, economical accessories give you improved station performance

[1] Smart Outlet Box for Amateur Radio systems

$59.95 Kit

- **Turn on one piece of equipment to power up six others**
- **Faster response, superior surge protection and noise filtering**
- **Build your own or purchase UL approved assembled version**

Power up six other units by turning on a device plugged into the control socket. An eighth socket is unswitched for devices such as clocks which you do not wish to turn off. The control socket allows a small amount of current to pass through it for equipment containing digital clocks. See page 99 for details.

Kit GD-1495, Shpg. wt. 5 lbs. **59.95**

GDW-1495, Assembled and tested (UL Approved), Shpg. wt. 4 lbs. **99.95**

[2] Low-cost quieting Mura 8-ohm headphones

Make copying traffic a lot easier with Mura SP-104 Headphones featuring a wide 40 to 15,000 Hz frequency range, 2¼" dynamic speakers for clear comprehension, individual volume controls, and isolating ear cups. Headphones include 10' coiled cord with ¼" plug.

HDP-1396, Assembled, Shpg. wt. 2 lbs. **14.95**

[3] Highly accurate Dip Meter covers 1.6 to 250 MHz

The multi-purpose HD-1250 has dozens of practical uses in your lab and hamshack. It can aid in finding the approximate resonant and operating frequency of either energized or de-energized circuits and help you adjust traps, detect parasitic oscillations and harmonics, measure unknown Q/L/C values, locate sources and frequencies of RF energy, or functions as a signal generator, relative field strength meter, or receiver alignment tool. In the balanced Colpitts RF oscillator, silver mica coupling capacitors improve frequency stability.

A broadband MOSFET amplifier, hot-carrier diodes and a Q-multiplier improve sensitivity and dip action. A responsive 150 μA meter movement yields sharper resonance indications. Includes a headphone jack for positive modulation monitoring. Requires 9-volt battery (not included).

Kit HD-1250, Shpg. wt. 4 lbs. **89.95**

HD-1250 SPECIFICATIONS: Frequency Range: 1.6 to 250 MHz. **Controls:** Tuning capacitor, oscillator level control, and ON/OFF switch. **Meter Movement:** 150 microamperes. **Solid-State Circuits:** 1 NPN transistor oscillator, 1 dual-gate MOSFET amplifier and two diffused silicon hot carrier diode detectors. **Power Source:** 9-volt NEDA type 1604 battery. **Net Weight:** 2 lbs. **Dimensions:** 2"H x 2¼"W x 5⅞"D.

[4] Coaxial Switch for routing up to 4 antennas

The HD-1234 is designed to switch one RF source or receiver to any one of four antennas, or RF loads while grounding the unused connectors. It has a power handling capability of 1000 watts (2 kW PEP) with a maximum 1.1:1 SWR to 250 MHz. A mounting bracket is included that allows you to conveniently hang the Switch on the side of an equipment enclosure, onto a desk, or on any wall.

HD-1234, Assembled, Shpg. wt. 1 lb. **22.95**

[5] Heath 'Cantenna' dummy load

Handles 1 kW of RF with VSWR's less than 1.5:1 for frequencies up to 450 MHz. Eliminates unnecessary QRM during tune-up and minimizes mistakes while performing 'hot' gear maintenance or alignment.

Kit HN-31A, Shpg. wt. 3 lbs. **19.95**

[6] End your TVI problems with this low-pass filter

Solve emissive RF interference problems with this fine low-pass Barker & Williamson filter designed for use in the 160 to 10 meter frequency range. It provides a minimum of 70 dB of attenuation. Cut-off frequency is 34 MHz and has less than a 0.3 dB insertion loss. It has a 50 ohm impedance and is rated for legal power.

HDP-3700, Assembled, Shpg. wt. 2 lbs. **34.95**

[7] Twelve-socket power Outlet Strip has many uses

Handy HD-1274 Outlet Strip multiplies convenience by providing extra electrical outlets for your equipment in a hamshack, workshop, office, basement or garage. It has eleven fused 3-hole outlets that can be switched on and off. It also has one unswitched outlet that can be used for a clock or equipment equipped with memory saver circuits. The Outlet Strip is rated at a 10-amp maximum load and has a 12-foot cord. The HD-1274 is an excellent way to extend 120 VAC to a large group of equipment in one location.

Kit HD-1274, Shpg. wt. 4 lbs. **24.95**

[8] CONTROLLED MAGNETIC Fixed Station Microphone

Designed by Shure with Amateur Radio features. Dual selectable output impedance and frequency response tailored for intelligibility. Select Normal or VOX operation. Push-to-talk switch bar for momentary or locked operation.

HDP-444, Assembled, Shpg. wt. 3 lbs. **59.95**

[9] 80 to 10 meter Cushcraft AV5 has long DX reach

Vertically polarized 25 ft. high omni-directional antenna provides complete CW and SSB coverage on 80-40-20-15-10 meters. Handles 2000 watts PEP.

HDP-1473, Shpg. wt. 10 lbs. **119.95**

[10] Heathkit HD-1481 Remote Coax Switch

$79.95

- **No need to run a control line – the HD-1481 sends signals on your existing coax feed**

Conveniently control the switching of antennas from inside your station. Two units, a remote and indoor control unit, interconnect through your existing coaxial cable to eliminate the need for any multiconductor control cable. The remote, a tower- or mast-mounted RF remote coaxial switch, can operate up to four antennas. It is rain tight and mounts with a single clamp.

The control unit contains the power supply and provides the switching signals to the remote. A front-panel switch selects the desired antenna. Handles 2000 watts PEP and has a VSWR of 1.15:1 or less. Frequency range from 1.8 to 54 MHz with impedance of 50 to 70 ohms and a loss at 54 MHz of less than 0.2 dB. Operates from 120 VAC at 50/60 Hz and measures 2⅝" H x 5½" W x 7½" D. Remote is 7⅜" H x 8⅜" W x 4½" D.

Kit HD-1481, Shpg. wt. 5 lbs. ..... **Was $99.95 Now Only 79.95**

[11] Dual HF Wattmeter measures up to 2000W PEP

$99.95

- **Reads PEP or average power from 1.8 to 30 MHz**
- **Has factory assembled and calibrated sensor**

Installed in your transmission line, the HM-2140A monitors both forward and reflected power simultaneously. A second scale on the reflected meter reads SWR directly from 1:1 to 3:1 for fast easy measurement of your outgoing signal.

Measure your transmitter's output up to 200/2000 watts PEP (±5%) in the forward direction and up to 50/500 watts reflected. Pushbutton-switched high and low power ranges plus a factory-tested sensor ensure precise readings every time. Another dual-position switch enables you to read PEP or Average power.

The HM-2140A can be operated on a 9-volt battery (not included) or use 120 VAC with the PS-2350 Battery Eliminator. A special switching circuit permits you to observe the battery condition at any time. The precision RF sensor can be mounted in the cabinet or used up to four feet away.

Kit HM-2140A, Shpg. wt. 5 lbs. **99.95**

PS-2350 120 VAC Battery Eliminator, Shpg. wt. 1 lb. **7.95**

[12] Innovative Phone Patch utilizes new design

$49.95

- **New design and circuitry eliminate bulky hybrid transformers**
- **FCC registered as a protective device**
- **Filtering provides high degree of electrical isolation**

New design and special integrated active speech and transmission circuits make this Phone Patch a breakthrough in transferring audio signals between a telephone line and two-way radio equipment. It runs on phone line voltage, with battery assistance in very low voltage conditions (battery not included). Ideal for voice-operated installations, the Phone Patch provides a high degree of electrical isolation from your radio equipment. And you can monitor your transmissions on the phone line. A built-in detector circuit allows adjustment with a VTVM or VOM for optimum separation between transmit and receive. One-evening kit.

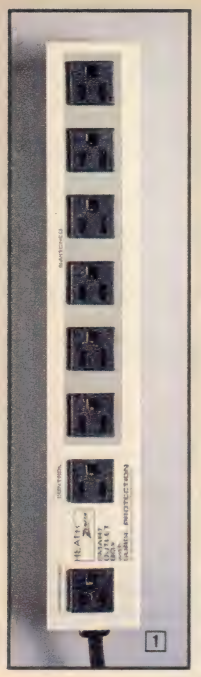
Kit HD-1515, Shpg. wt. 2 lbs. **49.95**

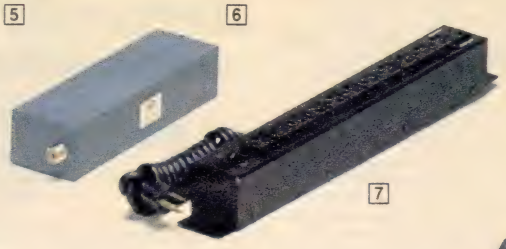
[13] Active SWL Antenna for 300 kHz to 30 MHz

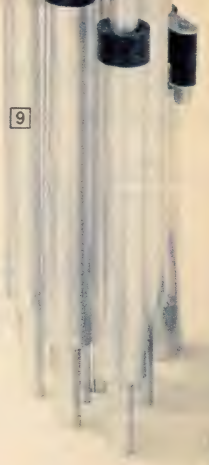
The Active SWL Antenna allows you to receive radio signals between 300 kHz to 30 MHz. It also acts as a high frequency preamplifier when used with an external 50 ohm antenna and can be used as a preselector for both indoor and outdoor antennas. It has a built-in collapsible antenna and provisions for a 50 ohm antenna. It operates on a 9-volt battery or external 6 to 14 volt DC source such as the PS-2350 (p. 48) and measures 2¼" H x 5⅛" W x 5" D.

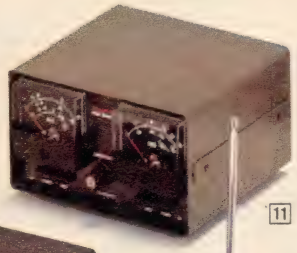
Kit HD-1424, Shpg. wt. 5 lbs. **49.95**

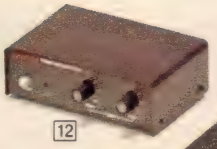
Use your Visa or MasterCard Credit Card to order your kit!

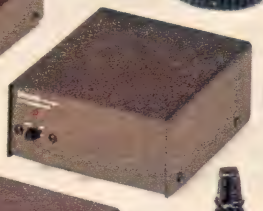


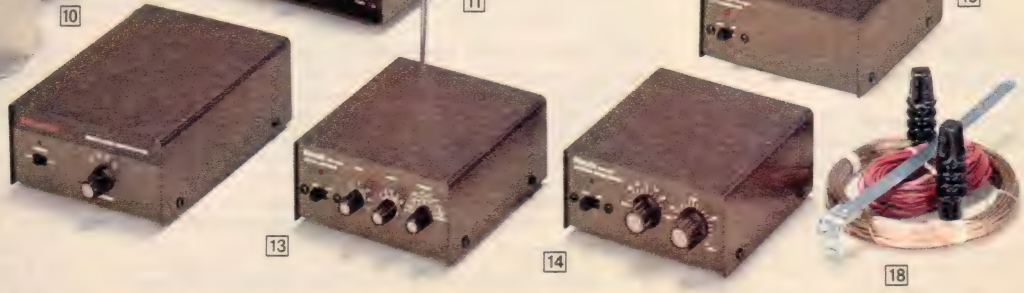












14 Antenna Noise Bridge helps tune antennas

The Antenna Noise Bridge reveals the cause of any mismatch between the station transmitter and antenna so you can trim each antenna for the most effective transmission. It can also be used to preset an antenna tuner for faster tuneup; to tune a quarter-wave transmission line; and to measure the value of unknown capacitors and inductors. Operates on a 9-volt battery (not included) or PS-2350 AC Power Supply (see page 48). Measures 2¼" H x 5⅛" W x 5" D.

Kit HD-1422, Shpg. wt. 2 lbs. **49.95**

15 Tune 10 to 500 kHz band with VLF Converter

The Very Low Frequency Converter installs in your receiver antenna line to let you listen to the 10 to 500 kHz band from 3.5 to 4.0 MHz. The converter's local oscillator generates a 3.5 MHz signal that, when mixed with the incoming VLF frequencies on your antenna, produces an RF signal that can be heard on any CW receiver capable of tuning 3.510 to 4.010 MHz. Operates on a 9-volt battery (not included), Power Supply PS-2350 on page 48, or any DC power source, 8.5 to 14 volts. It measures 5⅛" H x 5⅛" W x 2¼" D.

Kit HD-1420, Shpg. wt. 2 lbs. **49.95**

16 Mobile Antenna for the 146 to 148 MHz range

Cushcraft AMS-147 ⅝-wave 2-meter mount with 90 lb. grip-tight magnet makes it easy to air a signal in many vehicles – even your boat. Boasts 3 dB gain for more range. Stainless steel whip with thumb-lock adjustment and chrome-plated base. Includes PL-259 connector and coax.

HDP-1472, Shpg. wt. 3 lbs. ..... **Was $37.95 Now Only 29.95**

17 Specially designed short wave listening antenna

Completely assembled and ready to use, the heavy 14-gauge HDP-7800 antenna covers 60-49-41-31-25-19-13-11 meters. A high-performance trapped dipole with an overall length less than 43 feet.

HDP-7800, Shpg. wt. 3 lbs. **64.95**

18 Long-wire SWL Antenna for the serious listener

This 75-foot SWL antenna really helps you pull in distant stations. This copper line short wave listening antenna has a 30' lead-in which includes all insulators and hardware for easy setup.

GRA-72, Shpg. wt. 2 lbs. **14.95**

1 Get in on the fun of the RTTY revolution with the HD-3030 RTTY Terminal Interface

SAVE $50

$199.95

- **A "universal" terminal interface – works with most popular personal and home computers**
- **Built-in supply for noncomputer 20/60 mA TTY operation**
- **Six poles of active, preselect filtering**

The features you need most for enjoyable copy: Weak or distorted signals are no problem. Six poles of active preselect filtering deliver strong, readable tones that print clearly, even in a crowded band. Optional filters for 425 and 850 Hz audio shifts enable even more performance. It features separate RTTY and CW demodulator boards, 170 Hz standard shift, crystal-controlled AFSK generator, capability for full FSK with equipped transmitters, true mark/space detection, oscilloscope tuning outputs, front panel LED bargraph tuning, and data and status indicators.

The HD-3030 Terminal Interface has no equal in quality or function for the price. TTL and RS-232C I/O compatibility, plus a built-in loop supply make it a great buy, regardless of the rig or printer you prefer!

Kit HD-3030, Shpg. wt. 8 lbs. ..... **Was $249.95 Now 199.95**

Universal 425/850 Hz Filter Circuit Board Accessory. Provides frequency shift of 425 or 850 Hz (builder's option). Plugs directly into HD-3030 motherboard.

Kit HDA-3030-2, Shpg. wt. 1 lb. **14.95**

170 Hz Preselector Filter Circuit Board Accessory. Dramatically improves performance of standard shift tones by removing strong adjacent channel signals.

Kit HDA-3030-4, Shpg. wt. 1 lb. **19.95**

HD-3030 SPECIFICATIONS: Displays: LEDs for Power, Send, RDA, Mark, Space. Ten-segment bargraph tuning indicator. **PUSHBUTTONS:** Power, Operate/Standby, Send/Receive, CW/RTTY, Send/Receive (Reverse Shift), Preselect/Bypass, and 170 Hz, 425 Hz, 850 Hz (independent and interlockable audio frequency shifts). **REAR PANEL:** Loop jack input (100 VDC @ 20 or 60 mA); 25-pin DB-25 I/O connector for TTL and RS-232 computers, terminals or printers; 120 VAC/340 W auxiliary power outlet; groundpost; line cord. **CW DEMODULATOR: Center Frequency:** 750 Hz. **– 3 dB Bandwidth:** 70 Hz. **– 20 dB Bandwidth:** 240 Hz. **Dimensions:** 3" H x 7½" W x 10" D (7.6 x 19 x 25.4 cm).

SUPER CW Software for Heath H-8 and H/Z-89 computers. Has auto CW-ID, user-configurable parameters, type-ahead buffer. Requires H-DOS 1.5 or above.

HDP-1010, Shpg. wt. 2 lbs. **29.95**

SUPER RTTY Software for Heath H-8 and H/Z-89 computers. ASCII/Baudot system uses full disk/graphics capabilities. Requires H-DOS 1.5 and 24K memory.

HDP-1020, Shpg. wt. 2 lbs. **29.95**

2 *UltraPro* CW Keyboard sends letter-perfect code and offers the versatility of easy programming

$149.95

- **The most intelligent microprocessor-based CW keyboard, with more functions and user-flexibility than any other**
- **Four-level random practice mode allows 1000 different and repeatable, 3000-character training sessions with unique 'copy' mode to teach typewriter proficiency "hands on"**

The HD-8999 *UltraPro* CW Keyboard represents the long-awaited third generation of code computers. It contains a host of specialized prompting features and a simplified operating system that minimize key errors and increase the ease and accuracy of high-speed sending.

Exclusive component-level diagnostic capability and two-key rollover (to keep up with proficient typists) make it the most advanced and first truly 'friendly' keyer. It uses a customized microprocessor and the latest in comfortable, 'human engineered' keyboard designs as a foundation for the most productive CW operating aid you can own. Status indicators, a non-volatile CMOS RAM (batteries included) and power-up diagnostics combine in what *73 Magazine* called "a compact gem of a keyboard."

Kit HD-8999, Shpg. wt. 7 lbs. **149.95**

HD-8999 SPECIFICATIONS: Key Nomenclature: 1 through 0 and A through Z in a standard QWERTY format. SET, WPM, PRAC/SPC'G, PROT/WT, PREV/SN, LOAD, STOP, TONE/CLICK, TUNE, DELETE WORD/DELETE, HOLD, SHIFT (two), AR, SK, BT, ES, KN, AS BK, DE and CQ. **Punctuation:** ?/'"-()!:; comma and period. **Speed Range:** 1-99 WPM. **Spacing:** less than or equal to speed. **Weighting:** Normal plus five 'light' and five 'heavy' settings. **Serial Number:** 1-9999, automatically generated. **Text Buffers:** 495 characters, total capacity. Individual buffers may be protected. **Keyer Output:** +25 V @ 100 mA; –200 V @ 40 mA. **Memory Backup:** Three mini-cells (included) with typical 1 year life. **Sidetone:** 300-1500 Hz adjustable. **Indicators:** 4-digit display plus SET, MSG, LOAD, PRAC and type-ahead buffer status LEDS. **Operating Range:** 32-140°F (0-40°C). **Power Requirements:** 7.5 to 11 VAC or 11 to 16 VDC. 450 mA max. Input for PS-5012 120 VAC Adaptor (on page 38). **Dimensions:** 2⅞" H x 15½" W x 8" D.

3 Heathkit's HD-3006 Crossfire Tuning Indicator

$39.95

- **Quick and easy tuning of RTTY transmissions, without the need of an oscilloscope or costly equipment**

The Heathkit HD-3006 Crossfire is a visual tuning indicator for radioteletype (RTTY) communication. Sixteen LEDs make up the display. Eight vertical LEDs identify mark signal strength; eight horizontal LEDs do the same for space signal strength. Just tune your receiver for maximum vertical and horizontal display – you'll get a strong signal for your computer or printer.

The Crossfire has a wide voltage range and is compatible with almost any interface/terminal unit that has oscilloscope outputs for tuning. *Put your scope back on the workbench.*

Kit HD-3006, Shpg. wt. 3 lbs. ..... **Was $49.95 Now Only 39.95**

HD-3006 SPECIFICATIONS: Display: Two 8-LED bars. Each bar requires approximately 14 dB no-signal-to-signal voltage ratio (5:1) for full use of the bars. **Input Level:** Threshold, 0.3 volts RMS on AC and 0.5 volts DC. Maximum, 15 volts RMS on AC and 15 volts DC. **Power Supply:** 8-16 volts AC/DC power cube (included with kit). **Dimensions:** 3¼" H x 5" W x 4" D.

Up-to-date Amateur Radio Courses reflect latest licensing needs – to put you on the air at any level

4 Completely revised Novice Course

$44.95

- **Communicate with nearly a million other hams all around the world – right from your own home by transmitting and receiving Morse code signals from your own station**
- **Heath guarantees that you will pass the Novice test or we will refund the full purchase price of the course**

Join the exciting world of Amateur Radio. It is a unique way to communicate one-on-one with a diverse group of people from all professions and in all countries. You'll be able to participate in Novice field day competitions, take part in Novice traffic nets to relay third-party messages and, in case of an emergency, you can provide an important public service.

This new, updated course comes from the long-time leader in Amateur Radio. Heath has prepared a self-instruction program that not only reflects the latest licensing requirements but that is guaranteed to help you earn a Novice ticket. Everything you need to get your license is in this comprehensive, well organized study package, including information on how you apply to take the latest exam. It also provides helpful guidelines for setting up and operating a good station when your license and personal call sign arrive.

Nine learning modules correspond to the subject areas covered in the Novice Exam. Each subject is presented in a clear, step-by-step manner so that you may progress through the course at your own rate. Check your progress with multiple choice questions at the end of each module. Three practice exams and a final which is styled after most often used Novice exams, give you the experience and confidence you want to pass the first time with flying colors. Two cassette tapes explain the RST signal reporting system, review electronic circuit components, and cover practical circuits. You will also learn the International Morse Code in letter groups and then improve your copy speeds to 5 words per minute.

ER-3701A, Shpg. wt. 7 lbs. **44.95**

Kit HD-1416A, Code Oscillator (see below), Shpg. wt. 2 lbs. **19.95**

5 Build up your code speed with this handy kit

$19.95

- **Sturdy telegraph key with adjustable rebound, built-in speaker with volume and tone controls**

Use this CW Code Oscillator to get your code speed up and pass your exam in a simple and inexpensive way. This handy Practice Oscillator features a telegraph key with adjustable rebound, built-in speaker, volume and tone controls, plus a headphone jack for private listening. And once you get your license, it can serve as a side tone oscillator for any transmitter using negative-grid block keying. 2⅝" H x 4⅛" W x 4⅜" D. Operates on 9V battery (not included).

Kit HD-1416A, Shpg. wt. 2 lbs. **19.95**

We'll help you get started in Amateur Radio

Save 23% by purchasing the ER-3701A Novice Course and HD-1416A CW Oscillator together. Includes 10% certificate good for up to $10 off Heathkit equipment.

SAVER! ERS-3701, Shpg. wt. 9 lbs. **49.90**

Credit Card Orders call TOLL-FREE: 800-253-0570. Alaska and Michigan Residents Call: 616-982-3411.

This CW keyboard lets you send letter-perfect code every time

FAST, EASY 3-EVENING KIT

Use the HD-3006 to fine-tune RTTY – put your scope back on the bench

Completely revised and updated courses to reflect the latest changes in Amateur Radio licensing requirements

6 Completely revised General License Course

$64.95

- **Leave the CB or Novice bands behind and progress to the full range of Amateur Radio experiences. Send your words and images around the world**

Move up to the General Class and get all the added privileges – more frequencies to operate on, plus voice transmission, radio teletype, slow-scan TV, facsimile, satellite activity – an impressive list of incentives that add up to more QSOs, QSLs and thousands of new friends gained via these modes.

An informative text takes you through the subjects covered on the written test. Its in-depth coverage will give you a wealth of concentrated information – more than enough to pass either the Technician or General Class written examinations. Later, keep it handy as a valuable reference.

The Course provides extra code practice to bring your copy speeds up to 15 words per minute. Since only 13 wpm is required to pass the General exam, the extra 'two-word edge' gives you more confidence to pass the code test.

Four simulated written tests give you test-taking experience, and allow you to review problem areas so you'll be better prepared for the actual exam. Once you pass your General exam, send us a copy of your new license or notice of passing to receive 5.0 CEU's and a Certificate of Achievement.

We guarantee you'll pass the General Class exam – or we'll refund your money for the program materials when you return them with a copy of your rejection notice. It's a claim exclusive to Heath.

ER-3702A, Shpg. wt. 21 lbs. **64.95**

7 Upgrade with the Advanced Class Amateur Radio License Course to achieve Advanced Class status

$54.95

- **Well-organized to make the most efficient use of your time**
- **We guarantee you'll pass the Advanced Class exam the first time – if you don't we'll refund the cost of the program**

Prepared with the General Class license holder in mind, ER-3703 is the first completely up-to-date compilation of the technical and examination material required to help you achieve Advanced Class status. It assumes you have a General license or have the equivalent skills and background knowledge.

Designed in the modular style proven most effective by educators, the Advanced License Course includes self-test reviews after each chapter to assure greater retention of the material. This format also makes it easy to identify problem areas *before* the test. The self-instructional nature of the Course allows you to progress at your own pace and backtrack to review any subject.

Fully one-fifth of the 80-15 meter HF spectrum in four specific subbands (3750-3850, 7150-7225, 14150-14225 and 21200-21300 kHz) is allocated to the Advanced and Extra Class license holders. Why be left out? These are the choicest frequencies with more DX hot spots and experienced amateurs. Demonstrate your desire for self-improvement and upgrade your ticket with the Heathkit/Zenith Advanced Class License Course. Send us a copy of your new license or notification of passing to receive 4.0 Continuing Education Units and a personalized Certificate of Achievement.

ER-3703, Shpg. wt. 9 lbs. **54.95**

Ideal oscilloscopes for a wide range of applications plus a precise scope calibrator

1 New versatile 20 MHz Dual Trace Oscilloscope

$500.00

- **High 5 mV/cm sensitivity and fast 200 ns/cm sweep speed**
- **Even lower 1 mV/cm sensitivity in X5 magnification mode**
- **Completely assembled and competitively priced**

The Heathkit SO-4221 Dual Trace Oscilloscope is built to meet a user's demand for excellent performance at a low cost. A high 5 mV/cm sensitivity for both channels makes possible the observation of many low-level waveforms. Plus you can select from 20 calibrated sweep time ranges from 0.2 μs/div to 0.5 s/div with fully adjustable sweep times between ranges.

Select either automatic or manual triggering from four different sources including an external input. With the trigger mode selector set to TV, the oscilloscope can be set to easily observe stable TV or video signals. And for closer observation of different waveforms, a X5 sweep magnification is provided. This also provides the scope with a very low 1 mV/cm sensitivity.

Other features include a hold-off function for observing complex waveforms, X-Y operation, a Z-axis input, a front panel calibration signal, and a bright, 8 x 10 division CRT with an internal graticule for easier waveform viewing.

SO-4221, Assembled, Shpg. wt. 20 lbs. **500.00**

SO-4221 SPECIFICATIONS: VERTICAL: Sensitivity: 5 mV to 5 V/div ±3%, 10 steps in a 1-2-5 sequence. X5 to 1 mV. **Bandwidth:** DC: DC to 20 MHz (within −3 dB). AC: 10 Hz to 20 MHz (within −3 dB). 15 MHz at X5. **Rise Time:** 17.5 ns or less. **Overshoot:** 3% or less. **Input Impedance:** 1 megohm ±2%, 25 pF ±3 pF. **Maximum Input Voltage:** 400 volts P-P or 200 volts (DC + AC peak). **Operational Mode:** CH1, CH2, DUAL, ADD (In DUAL, ALT and CHOP are selected according to the sweep time). **Chop Frequency:** Approximately 250 kHz. **Cross Talk:** 60 dB or more (at 50 kHz). **HORIZONTAL: Sweep Time:** 0.2 μs to 0.5 s/div ±3%. 20 steps in a 1-2-5 sequence. **Magnification:** 10 times 20 ns/div (at X10 MAG). **Linearity:** 3% or less. **Sweep Mode:** NORMAL, AUTO, SINGLE. **TRIGGER: Signal Source:** INT CH1, CH2, LINE, EXT. **Sensitivity:** INT: 1.5 div or more (20 Hz to 20 MHz). EXT: 0.2 volt P-P or more (20 Hz to 20 MHz). **Coupling:** DC, AC, HF, REJ, TV. **Polarity:** + or −. **X-Y OPERATION: Sensitivity:** 5 mV to 5 V/div. **Bandwidth:** DC to 1 MHz (within −3 dB). **Z-AXIS: Input Voltage:** 3 V P-P or more (bright at negative-going). **Frequency Range:** DC to 5 MHz. **GENERAL: Calibration Voltage:** 3 V P-P ±5% (1 kHz wave). **Component Tester Test Power:** Maximum 9 VAC. **CRT:** 8 x 10 div (1 div = 10 mm), with internal graticule. **CRT Voltage:** 2.1 kV. **Power Requirements:** 110/220 VAC, 50/60 Hz. **Dimensions:** 12⅜" W x 6½" H x 17⅛" D (31.5 x 16.5 x 43.5 cm). **Weight:** 16.1 lbs. (7.3 kg).

2 Save $100 on the Time-Voltage Accessory Module

Automatically analyze any waveform displayed on the IO-4225 Scope. Specifically designed to enhance the measurement capability of the Dual Trace IO-4225, the Time-Voltage Module displays time, frequency or ± DC voltages at whatever point the scope probe is placed. Just select the desired function on the module and press a button. The autoranging module then indicates the reading in a bright 3½ digit display. Measure time intervals from 1.0 s to less than 20 ns and waveform frequencies from 1 Hz to 19.99 MHz. Read ± DC voltages from a low 0.1 mV to 199.9 V with an accuracy of 0.75%. Separate, isolated inputs enable the IOA-4200 to measure voltages up to a higher ±1000 volts. Has automatic placement of the decimal point, plus time and frequency unit indicators.

Mark any portion of a waveform displayed on the IO-4225 Oscilloscope with variable reference and measurement cursors and easily obtain an instant readout of its period, frequency or pulse width. Just as easily, measure and display risetimes, burst or ringing frequencies, and the time difference between pulses.

Kit IOA-4200, Shpg. wt. 7 lbs. ..... **Was $349.95 Now Only 249.95**

IOA-4200 SPECIFICATIONS: TIME: Ranges: ±10 s to ±2.0 μs (1, 2, 5 fullscale sequence). **Basic Accuracy:*** ±2% of reading, ±1 count. **FREQ: Ranges:** ±1.0 Hz to ±0.5 MHz (1, 2, 5 fullscale sequence). **Maximum Display:** 19.99 Hz on 100 ms to 19.99 MHz on 0.2 μs. **Accuracy:*** ±3%, ±1 cm. **VDC (internal): Ranges:** ±2 V, 2V on 2 mV to 50 mV; 2 V, 20 V on 100 mV to 0.5 V; ±20 V, 200 V on 1 V to 10 V; autoranging. **Accuracy:*** ±1.0% (±0.75%); ±2 cnts. **EXT VDC: Ranges:** 2 V to 2000 V; autoranging. **Basic Accuracy:** ±0.5% (±0.25%), ±1 cnt. **GENERAL: Display:** 3½ digit, LED, automatic minus for negative, positive implied. **Dimensions:** 1½" H x 10¾" W x 9¾" D. *Accuracy specs are for built-in calibration. Numbers in ( ) are for laboratory standards calibration.

3 25 MHz Dual Trace Oscilloscope with built-in tester

$499.95

- **Wide DC to 25 MHz bandwidth with 5 mV/cm sensitivity**
- **Extremely stable triggering with delayed sweep**
- **Full X-Y operation plus sync separation for TV signal viewing**
- **Built-in component tester checks diodes and transistors**
- **Can be used with optional IOA-4200 Time-Voltage Module**

This laboratory-grade test instrument is ideal for the wide range of measurements made in general electronics shops, development laboratories, and scientific research facilities. And, it is priced so that hobbyists can take advantage of this indispensable troubleshooting and alignment tool.

Select from 11 calibrated ranges on both vertical input channels from 5 mV/cm to 10 V/cm with variable control between ranges. Several signal display modes are obtained by using the Vertical Mode and Time Base switches with either or both channels displayed as a function of time or in an X-Y mode.

The time base ranges from 0.1 s/cm to 0.1 μs/cm in 19 calibrated steps. Each step is continuously variable and can be expanded 5 times. A delayed sweep allows you to select the exact portion of a waveform for critical viewing. An external horizontal input can be applied at a front panel BNC connector.

Precise triggering is controlled by four Select switches and the Level control. Trigger at any positive or negative point on a waveform using various trigger signals and coupling modes. For stable TV signal viewing, switch in an active TV filter that separates vertical and horizontal sync pulses from complex video signals. Display a baseline with or without a trigger signal. Can also be externally triggered.

Waveforms are displayed on a high-brightness 5-inch CRT with internal 8 x 10 cm graticule. A special test function displays the I-V curve of transistors, diodes, etc. showing a characteristic curve to enable quick checks of suspect components. Add on the IOA-4200 Time-Voltage Module for increased capability.

Kit IO-4225, Shpg. wt. 28 lbs. ..... Not Available

IO-4225 SPECIFICATIONS: VERTICAL: Display Modes: Y1, Y2, Dual, Alt/Chop (Chop frequency, approx. 200 kHz). **Channels Y1 and Y2:** Accuracy: Within 3%. Rise Time: 16 ns or less. Overshoot: less than 5%. **HORIZONTAL: Modes:** A, AXB, B, X-Y, Ext. Horiz. **A and B Time Base Accuracy:** Within 3%. **External Sensitivity:** 0.1 V/cm. **TRIGGER: Source:** Y1, Y2, EXT, Line. **Coupling:** AC, DC, TV-V, TV-H. **Modes:** Automatic baseline, Normal. **GENERAL: 1-volt P-P CAL Accuracy:** Approx. 5%. **CRT Phosphor:** P31. **Power Requirements:** 110/220 VAC, 50/60 Hz. **Dimensions:** 6" H x 18" L x 10" W. **Weight:** 19.5 lbs.

4 5 MHz Dual and Single Trace Oscilloscopes

- **Excellent 10 mV/cm input sensitivity with variable attenuation**
- **Triggered horizontal sweep stabilizes nearly all types of waveforms**
- **Special TV trigger coupling function allows easier TV signal triggering**

An outstanding value, the IO-4205 Dual Trace Oscilloscope is a welcome addition to the laboratory, service shop, or home work shop. It is a compact, versatile and easy-to-build test instrument that lets you study waveforms in many different types of electronic circuits. Its many features provide the accuracy and capability found only in higher-priced oscilloscopes.

The dual trace capability of the IO-4205 enables you to directly compare two signals, as well as, check phase and other timing functions. And the 10 mv/cm input sensitivity and DC to 5 MHz bandwidth of the IO-4205, allows you to use it in many fast, low-level waveform applications.

Seven calibrated time bases, from 200 ms/cm to 0.2 μs/cm, is another feature of this value-packed oscilloscope, each range is variable controlled for added accuracy and user convenience. With the IO-4205, you can even display X-Y signals by applying an external horizontal signal.

A stable triggering circuit, a feature found on more expensive scopes, brings the advantages of triggered sweep with automatic sync to the IO-4205. This scope also has a special TV setting in the triggering network which allows low frequencies to pass while rejecting high frequencies.

Other features include an 8 x 10 cm graticule and a bright CRT that allows the user to make quick and accurate waveform measurements without eye strain. A precise source of square waves like those provided by the IG-4505 (page 48) or the IG-4244 Calibrator (page 45) is needed to calibrate the IO-4205 Oscilloscope.

Kit IO-4205, Shpg. wt. 25 lbs. **349.95**

The IO-4105 Oscilloscope is an excellent, low-priced alternative to situations where only a single trace oscilloscope is needed. It has all the features and performance of the IO-4205 Dual Trace Oscilloscope with only one vertical input channel. Also requires IG-4505 or IG-4244 for calibration.

Kit IO-4105, Shpg. wt. 25 lbs. **279.95**

IO-4205/IO-4105 SPECIFICATIONS: Bandwidth: DC to 5 MHz, ±3 dB. **Sensitivity:** 10 millivolts/centimeters. **Attenuator:** 1-2-5 sequence, calibrated and variable. **Rise Time:** 70 nanoseconds. **Overshoot:** Less than or equal to 5 percent at 1 kilohertz. **Impedance:** 1 megohm, shunted by 38 picofarads. **SWEEP: Type:** Triggered. **Range:** 200 milliseconds to 0.2 microseconds in seven steps, plus variable. **Trigger Source:** Y1, Y2, External, Line. **Trigger Modes:** AC, DC or TV; plus or minus slope; automatic or normal. **HORIZONTAL: Sensitivity:** 0.1 volt/centimeter. **Bandwidth:** DC to 1 megahertz. **Impedance:** 1 megohm, shunted by 50 picofarads. **External Horizontal Input:** X1 and X10 attenuator, as well as variable. **GENERAL: CRT:** 5DEP31F, 8 x 10 centimeters viewing area, blue-green medium-persistance phosphor, 5-inch round flat-face tube. **Accelerating Potential:** Approximately 1.6 kilovolts. **Graticule:** Screened, 8 x 10 centimeters. **Power Requirements:** 120/240 VAC, 50/60 Hz. **Overall Dimensions:** 8" H x 13" W x 17" D (20.3 x 33 x 43.2 cm). **Weight:** 15 lbs. (6.8 kg).

VISA MasterCard **Discover the fun of kitbuilding at your Heath/Zenith Computers & Electronics Center.**

[5] Save $50 – Dual Trace 10 MHz Oscilloscope offers a wide range of measurement capability

- **Precise performance with a DC to 10 MHz response and a 35 ns rise time to accurately display high-speed square waves**
- **Two vertical input channels with eleven calibrated ranges from 10 mV/cm to 20 V/cm including variable control**
- **Calibrated time base ranges from 0.2 s/cm to 0.2 μs/cm**
- **Built-in component tester**

Combining excellent sensitivity, stability and versatility with most desired features; Heath engineers have developed a laboratory-grade oscilloscope that is ideal for the wide range of measurements encountered in electronics, developmental laboratories and scientific research. And it is in the price range of the service technician as well as the part time hobbyist.

Select several methods of displaying a signal on the 8 x 10 cm rectangular viewing area. Either or both channels can be displayed as a function of time or of each other. At lower speeds both channels are displayed in a chopped mode to avoid flickering while at higher speeds both signals are displayed alternately. Front panel X-Y operation uses the scope's matched vertical amps.

A complete trigger system features various trigger signals including the choice of sampling either channel, an externally applied trigger signal or using part of the line voltage. To control the trigger input bandpass, a tri-level mode switch is provided. A special active TV filter cuts off unwanted high frequency signals for easier triggering on TV vertical signals.

Calibrating the IO-4210 requires an accurate source of square waves such as the IG-4505 on page 48 or the IG-4244 Precision Calibrator on page 45. A calibrated 1 volt P-P square wave signal is provided at the scope's front panel for checking scope probes. A built-in component tester allows you to check in-circuit and out-of-circuit electronic components.

Kit IO-4210, Shpg. wt. 28 lbs. ..... **Was $449.95 Now Only 399.95**

IO-4210 SPECIFICATIONS: VERTICAL: Deflection Factor: Sensitivity: 10 mV/cm to 20 V/cm, 11 steps in 1-2-5 sequence. **Variable:** Continuous between steps to approximately 60 V/cm. **Accuracy:** 3%. **Vertical Response: DC Coupling:** DC to 10 MHz. **AC Coupling:** 2 Hz to 10 MHz. **Rise Time:** 35 ns. **Overshoot:** Less than 5%. **Attenuator: Vertical Input: Impedance:** 1 megohm, shunted by 38 pF. **Maximum Input:** 400 volts peak, combined AC and DC. **Connector:** BNC. **Modes:** Signal, Y1 or Y2 selected by position control; Dual, Chopped (200 kHz) or alternate automatically selected by time/cm switch. **HORIZONTAL: Time Base: Ramp:** 200 ns/cm to 0.2 s/cm, 19 steps in 1-2-5 sequence. **Variable:** Continuous between steps to approximately 0.6 s/cm. **Accuracy:** 3%. **Magnifier:** X5 (adds additional 2% to sweep accuracy). **EXTERNAL: Sensitivity:** Approximately 0.1 V/cm. **Impedance:** 1 megohm. **Polarity:** Positive input causes right-hand deflection. **Frequency Response:** DC to 1 MHz. **Connector:** BNC. **Trigger: Internal: Automatic:** Adjustable over 10 divisions. **Normal:** Adjustable over 10 divisions. **Slope Selection:** + or −. **Impedance:** 1 megohm, shunted by 40 pF. **Connector:** BNC. **X-Y: Y-Channel:** Same as vertical. **X-Channel:** Same as vertical, except response limited to 1 MHz. **GENERAL: Operating Temperature Range:** 50-104 degrees F (10-40 degrees C). **Power Requirements:** 120/240 VAC, 50/60 Hz, 70 watts. **Overall Dimensions:** 6⅞" H x 12⅞" W x 19¼" D (17.6 x 32.7 x 48.9 cm). **Weight:** 22 lbs. (10 kg).

[6] Precision Oscilloscope Calibrator helps maintain scopes at their peak performance level and accuracy

- **Provides accurate time and amplitude signals for calibrating most scopes**
- **Less than 1 nano second rise time for calibrating scopes above 100 MHz**
- **Doubles as an accurate signal source for testing or experimenting**

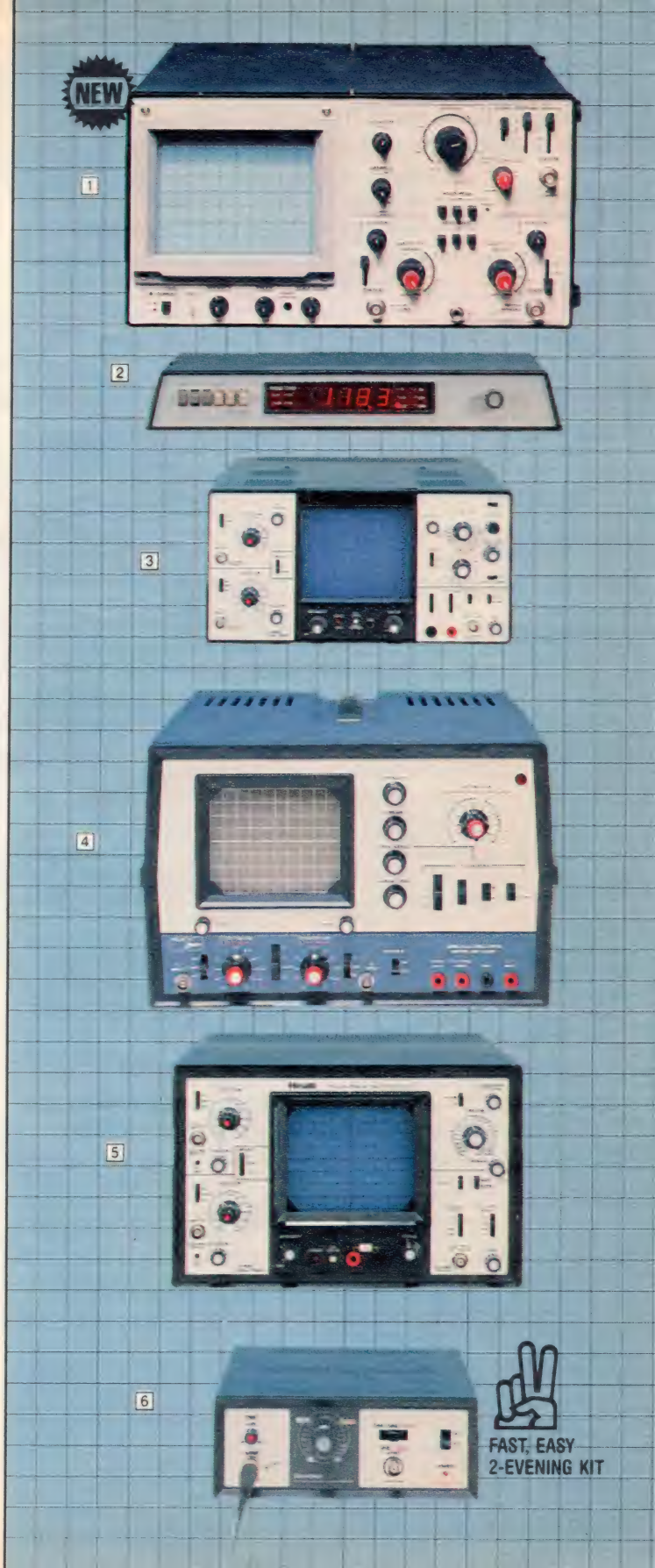
A laboratory-precise calibrator, the IG-4244 provides a source of accurate time and amplitude signals for making critical oscilloscope adjustments and calibrations. With its range of outputs and accuracy, this quality instrument is exceptionally equipped for calibrating scopes with bandwidths over 100 MHz.

Two crystal oscillators supply twenty-four square wave signals with very accurate times from 0.5 seconds (2 Hz) to 10 nanoseconds (100 MHz) through a 1-2-5 sequenced range switch. The rise time of these signals is less than 1 nanosecond (with less than 2% or 10 mV aberrations) making them very well suited to use in high frequency compensation adjustments on oscilloscope vertical amplifiers. Time accuracy is held to a critical 0.015%.

Sixteen precise square wave voltages, at about 1 kHz, are available for scope vertical calibration and attenuator compensation networks. These voltages range from 1 mV to 100 V peak through a 1-2-5 sequenced switch. Also available is a sine wave signal output of approximately 1 kHz at 1 volt peak-to-peak. This signal is especially useful in adjusting scope trigger circuits.

In addition to its scope calibrator functions, the IG-4244 can be used as a bench standard for calibrating other test equipment. Or, this precise calibrator can be used as a signal source for testing equipment or other experimental projects. Easily assemble in about 8 hours and uses 120/240 VAC, 50/60 Hz.

Kit IG-4244, Shpg. wt. 6 lbs. **149.95**



Rugged and accurate digital multimeters and test equipment for years of dependable service

1 Versatile Component Tracer effectively increases your troubleshooting capability and efficiency

$249.95

- **Test unpowered circuit boards and components**
- **Quickly identify defective circuit boards**
- **Display comparisons between boards or components**

An extremely helpful troubleshooting tool, the IT-2232 Component Tracer enables a user to check digital and analog circuits that have no power applied to them. In either of its two channels, the Tracer can display the unique E/I characteristic curve of components or circuits on its 3-inch CRT. In the superimposed mode, two components or circuit boards can be easily compared as one channel uses a dotted line display made possible by a new patent-pending circuit. Two ranges, 5 and 50 volts, are provided for testing low and high voltage capacity devices.

Kit IT-2232, Shpg. wt. 15 lbs. **249.95**

IT-2232 SPECIFICATIONS: Display Modes: Channel A; Channel B; Dual. **Channel A:** Solid line trace. **Channel B:** Dotted line trace. **Trace Voltages:** 5 volts and 50 volts peak-to-peak. **Current Limits:** 5 volts peak-to-peak at 5 milliamps; 50 volts peak-to-peak at 0.5 milliamps. **Operational Controls:** Focus. Intensity. Vertical and Horizontal Position. **Cathode Ray Tube (CRT):** 3RP1A, round 3-inch flat face. **Accelerating Potential:** Approximately 1.1 kilovolts. **Operating Temperature Range:** 50 degrees F to 104 degrees F (10 degrees C to 40 degrees C). **Power Requirements:** 120/240 VAC, 50/60 Hz, 22 watts. **Dimensions:** 4" H x 10" W x 12½" D (10.2 x 25.4 x 31.5 centimeters). **Weight:** 8.4 lbs. (3.8 kg.).

2 True RMS measurements of complex waveforms

$249.95

- **True RMS readings of all AC voltages and currents**
- **Special diode test function checks semiconductors**
- **Features analog meter, alarm and crest warning LED**

A true RMS reading digital multimeter, the Heathkit IM-2264 uses a special circuit that electronically converts all AC signals into true RMS values. This meter is also capable of accurately measuring DC and AC voltages from 0.1 mV to 1000 VDC and 750 VAC in five ranges, DC and AC currents from 0.1 μA to 10 A in six ranges, and resistance values from 0.1 ohm up to 20 megohms.

Additional features: An auto-polarity analog meter complements the LCD digital display making nulls, peaks and trends easier to follow. A switch-enabled alarm function allows quick testing of voltage and continuity. A flashing crest warn LED alerts the operator of possible erroneous readings of AC signals due to an excessive crest factor. Battery or AC (using PS-2404 page 46) operated.

Kit IM-2264, Shpg. wt. 7 lbs. ..... **Last Call 249.95**

IM-2264 SPECIFICATIONS: Voltage Ranges: 200 mV, 2 V, 20 V, 200 V, and 1000 VDC (750 VAC). **Basic Accuracy: DC:** ±(0.5% of reading + 1 count). **AC:** ±(10.75% of reading + 2 counts). **DC and AC Current Ranges:** 200 μA, 2 mA, 20 mA, 200 mA, 2000 mA, 10 A. **Basic Accuracy: DC:** ±(0.5% of reading + 1 count). **AC:** ±(0.75% of reading + 2 counts). **Resistance Ranges:** 200, 2 k, 20 k, 200 k, 2000 k and 20 M. **Basic Accuracy:** ±(0.5% of reading + 1 count). **Special Features:** Crest Warn Indicator, Audible Alarm, Analog Meter. **Dimensions:** 3" H x 8½" W x 11" D. **Weight:** 2¾ lbs. (excluding batteries).

3 Economical five-function digital multimeter

$129.95

- **Convenient autozero, autodecimal and autopolarity**
- **Special test function checks diodes and transistors**

The Heathkit IM-2260 Digital Multimeter provides full capability for many general purpose applications. The bright, easy-to-read 3½ digit LED display shows DC and AC voltages up to 1000 VDC and 750 VAC. Pushbutton switches select all functions including DC and AC current in five ranges up to 10 amps and resistance in five ranges to 20 megohms. Input protection is provided.

Special features: To help determine the condition of diodes and transistors, the IM-2260 measures forward conducting voltage and reverse leakage resistance. DC or AC operation is possible with either six "C" size batteries (not included) or a PS-2404 battery eliminator (this page). A built-in battery charger keeps nickel-cadmium batteries (if used) recharged.

Kit IM-2260, Shpg. wt. 5 lbs. **129.95**

SM-2260, Assembled and tested, Shpg. wt. 4 lbs. **189.95**

IM/SM-2260 SPECIFICATIONS: Voltage: Ranges: 2 V, 20 V, 200 V, and 1000 VDC (750 VAC). **Basic Accuracy: DC:** ±(0.5% of reading + 1 count). **AC:** ±(1.0% of reading + 3 counts). **Frequency Response:** 40 to 1 kHz, ±0.5%. **Input Impedance:** 10 megohms. **Current: Ranges:** 2 mA, 20 mA, 200 mA, 2000 mA, 10 A. **Basic Accuracy: DC:** ±(1.5% of reading + 1 count). **AC:** ±(2.0% of reading + 1 count). **Ohms: Ranges:** 2 k, 20 k, 200 k, 2000 k, and 20 M. **Basic Accuracy:** ±(0.25% of reading + 1 count). **Dimensions:** 3" H x 8½" W x 11" D. **Net Weight:** 2¾ lbs. (excluding batteries).

4 Compact and portable handheld frequency counter

$149.95

- **High sensitivity allows very low signal pickup**
- **Crystal oscillator maintains excellent accuracy**
- **Includes rechargeable batteries for true portability**

Measure frequencies in two ranges from 50 Hz and 512 MHz with a guaranteed sensitivity 25 mV RMS (typically 10 mV RMS). Ideal for checking mobile car, boat and plane transmitter frequencies. Seven digit LED display gives an excellent 10/100 Hz resolution in low/high ranges. Uses five rechargeable 1.2 VDC nickel-cadmium batteries (included). Housed in rugged, compact case.

Kit IM-2400, Shpg. wt. 3 lbs. **149.95**

SMA-2400-1, Telescopic Antenna with BNC connector, Shpg. wt. 1 lb. **9.95**

PS-2404, 120 VAC Battery Eliminator/Charger, Shpg. wt. 1 lb. **7.95**

IM-2400 SPECIFICATIONS: Frequency Range: 50 Hz to 50 MHz and 40 MHz to 512 MHz. **Input Impedance:** 50 Hz to 50 MHz range, 1 megohm shunted by less than 24 pF. 40 MHz to 512 MHz range. 50 ohms. **Input Protection:** 50 Hz to 50 MHz range, 150 volts RMS to 100 kHz derating to 10 volts RMS at 50 MHz. 40 MHz to 512 MHz range, 5 volts RMS. **Time Base: Frequency:** 10 MHz. **Stability:** ±1 part per million (PPM). **Temperature Stability:** ±10 PPM from 0 degrees to 40 degrees C. **General: Gate Time:** 1.0 second or 0.1 second, switch selectable. **Resolution:** 50 Hz to 50 MHz, 10 Hz with time base set at 1.0 second. 40 MHz to 512 MHz range, 100 Hz with time base set at 1.0 second.

5 Handheld multimeter has bench meter features

$89.95

- **Basic 0.25% DC accuracy when set to lab standards**
- **Checks semiconductors and in-circuit resistances**
- **Easy fingertip control of ranges and functions**

The IM-2215 supplies all the advantages of a digital multimeter: a large and easily readable display, high accuracy and resolution, and superior overload protection. Other features include autozero, autopolarity and automatic decimal point placement. It provides a high 10 megohm input resistance on DC/AC volts ranges. Large 3½ digit LCD display has a low battery status indicator. Powered by ordinary 9-volt transistor battery (NEDA #1604, not supplied) or from AC line voltage using the optional PS-2350 120 VAC converter.

Kit IM-2215, Shpg. wt. 2 lbs. **89.95**

IMA-2215-1, Rugged Leather Carrying Case, Shpg. wt. 1 lb. **14.95**

PS-2350, 120 VAC Battery Eliminator, Shpg. wt. 1 lb. **7.95**

IM-2215 SPECIFICATIONS: DC Voltage: Ranges: 200 mV, 2 V, 20 V, 200 V, 1000 V. **Accuracy: Lab Standards:** ±0.25% of reading + 1 count (SM-2215, ±0.1%). **Built-in Standards:** ±0.35% of reading + 1 count). **AC Voltage: Ranges:** 200 mV, 2 V, 20 V, 200 V, 750 V. **Accuracy: Lab Standards:** ±0.5% of reading + 3 counts). **Built-in Standards:** ±0.6% of reading + 3 counts. **DC and AC Current: Ranges:** 2 mA, 20 mA, 200 mA, 2000 mA. **Basic Current Accuracy:** 0.75% (DC), 1.5% (AC). **Resistance: Ranges:** 200, 2 K, 200 K, 2000 K, 20 M. **Basic Accuracy:** 0.25%. **Dimensions:** 2" H x 3¾" W x 7½" L.

6 Deluxe handheld multimeter features dual digital and analog bar-graph measurement displays

$119.95

- **Manual and autoranging display with 0.3% DC accuracy**
- **"Touch-Hold" function locks in stable meter readings**
- **Auto self-test checks all critical functions**

This easy-to-use 3½ digit multimeter combines the precision of a digital meter with an analog bar-graph display. Get all the advantages of a DMM: autozero, autopolarity, and autoranging with accuracy and high resolution. Each time you turn the meter on you activate a 2-second diagnostic self-test of critical functions and the battery. The "Touch-Hold" function holds the value of a stable reading in the display even when the probes are removed. A quality meter from FLUKE.

SM-77, Assembled and tested, Shpg. wt. 3 lbs. **119.95**

SMA-77-1, Soft Carrying Case, Shpg. wt. 1 lb. **9.95**

SMA-77-2, Holster Case, Shpg. wt. 1 lb. **5.95**

SM-77 SPECIFICATIONS: DC Volts: Ranges: 320 mV, 3.2V, 32V, 320V, 1000V. **Sensitivity:** 0.1 mV (320 mV range). **Accuracy: 320 mV-320 V Range:** ±(0.3% of reading + 1 digit). **1000 V Range:** ±(0.4% of reading + 1 digit). **Input Resistance:** 10 megohms. **Overload protection:** 1000 V (500 V on 320 mV range only). **AC Volts: Ranges:** 3.2V, 32V, 320V, 750V. **Sensitivity:** 1 mV (3.2 V range). **Accuracy:** 3.2 V Range (45 Hz – 500 Hz); ±(2.0% of reading + 2 digits). **Input Impedance:** 10 megohms shunted by approx. 50 pF. **Overload Protection:** 750 VAC. **Ohms: Ranges:** 320, 3200, 32K, 320K, 3.2M, 32M. **Sensitivity:** 0.1 ohm (320 range). **Accuracy: 320 Range:** ±(0.5% of reading + 2 digits). **32M Range:** ±(2.0% of reading + 1 digit). **Power Supply:** Single standard 9V battery.

Credit Card Orders call TOLL-FREE: 800-253-0570. Alaska and Michigan Residents Call: 616-982-3411.

1
2
3

4
IM-2400
Frequency Counter
has 50 Hz to 512
MHz range

FAST, EASY
2-EVENING KIT
5
IM-2215 DMM
has 3½ digit
display and full
measuring capability

6
SM-77 with LCD
display and analog
bar graph display

Easy-to-use test instruments and handy accessories for use in all areas of electronics

1 Digital Capacitance Meter features hand-held convenience and an auto-ranging digital display

$159.95

- **Accurately measures capacitors to 199.9 mF**
- **Zero offset control compensates for stray capacitance and ensures direct display accuracy**
- **Special built-in circuitry detects lossy capacitors**

To measure the capacitance of any type of capacitor in any work environment, use the versatile IT-2250 Auto-Ranging Digital Capacitance Meter. It quickly and accurately measures the value of any capacitor within a range from 0 pF to 199.9 mF. Automatically, this instrument will select the correct range and display the units of capacitance on its large 3½ digit liquid-crystal display. Light-emitting diodes brightly indicate the correct units: pF, nF, μF or mF.

Key features include a Kelvin (4-terminal) error-canceling input connector, overload protected input, zero compensation control and the ability to detect a lossy/leaky capacitor. Other advantages: a low test voltage, a remote extension cable, and either battery (9-volt transistor battery) or AC (PS-2350, this page) operation. Display warns of low battery voltage.

Kit IT-2250, Shpg. wt. 3 lbs. **159.95**
IMA-2215-1, Leather Carrying Case, Shpg. wt. 1 lb. **14.95**
PS-2350, 120 VAC Battery Eliminator, Shpg. wt. 1 lb. **7.95**

IT-2250 SPECIFICATIONS: Ranges: 199.9 pF, 1999 pF, 19.99 nF, 1.999 μF, 19.99 μF, 199.9 μF, 1999 μF, 19.99 mF, 199.9 mF. **Accuracy: Using Laboratory Standards:** 199.9 pF, 1999 pF, 19.99 nF and 199.9 nF ranges ± (0.2% of reading + count + 0.5 pF); 1.999 μF, 19.99 μF, 199.9 μF, 1999 μF, 19.99 mF and 199.9 mF ranges ± (5% of reading + 1 count). **Using Heath Supplied Standards:** 199.9 pF, 1999 pF, 19.99 nF, and 199.9 nF ranges + (0.75% of reading + 1 count + 0.5 pF); 1.999 F, 19.99 F, 1999 μF, 19.99 mF and 199.9 mF ranges, ± (6% of reading + 1 count). **NOTE: The accuracy of the Heathkit IT-2250 Capacitance Meter depends on whether you calibrate with the Heath-supplied standards of laboratory standards. Specifications are listed above for both methods of calibration.** Accuracy specifications apply to a temperature range of 67 to 77 degrees F (19 to 25 degrees C). **Conversion and Display Rate:** For values up to 1999 μF, less than 1.5 seconds; For values up to 199.9 mF, less than 10 seconds. **Display:** 3½ digit (maximum count, 1999) liquid crystal. **Testing Voltage:** 2.00 VDC maximum; typically varying from 0.6 to 1.4 VDC. **Operating Temperature Range:** 32 to 104 degrees F (0 to 40 degrees C). **Storage Temperature Range:** −4 to +140 degrees F (−20 to +60 degrees C). **Battery Life:** Approximately four to ten hours, in continuous operation. **Battery Indicator:** Displays "LO BAT" warning when battery is down to approximately 5 VDC. **Overall Dimensions:** 2" H x 3¼" W x 7½" L.

2 Easy capacitance and inductance measurements

$269.95

- **Designed for fast, easy and accurate checking of inductors and capacitors**
- **All measurements are displayed on a high-brightness 3½ digit LED readout with automatic decimal point placement; range switch determines units display**

The versatile IT-2240 Digital LC Bridge is a laboratory-accurate instrument that measures capacitance and inductance, and their associated dissipation (loss) factor. On eight ranges, this compact unit measures inductance from less than 1 μH to 2000 H and capacitance from less than 1 pF to 2000 μF with a basic accuracy of ±0.5%. The dissipation factor of the component under test can be measured from 0.000 to 1.999 with a basic accuracy of ±3.0%.

Front panel slots provide a four-point Kelvin connection to eliminate the variable effects of components with large lead diameters or long lead lengths. Large or remote components are easily checked using a supplied accessory cable. Stray capacitance on lower ranges is eliminated with a front panel null control. A separate rear panel output connector supplies a DC voltage for batch testing capacitors and inductors as well as driving a plotter for charting capacitance/voltage curves. All inputs and connectors are over-voltage protected. The LC Bridge is powered by 120 VAC at 60 Hz, 15 watts maximum. Has dimensions of 3¾" H x 10" W x 12½" D and weighs 6½ lbs.

Kit IT-2240, Shpg. wt. 11 lbs. **269.95**

3 Easy-to-assemble Oscilloscope Calibrator

For use with most oscilloscopes, the IG-4505 supplies crystal-controlled square wave time signals from 0.5 s to 1 μs for use in adjusting sweep speeds, delay line terminations and high frequency compensation networks. The output has a fast rise time of less than 4 ns. Accurate voltage signals from1 mV to 100 V are also available for use in calibrating scope vertical inputs and attenuator compensation adjustments. This calibrator serves equally well as a bench standard for other equipment or as a signal source for test circuits.

Kit IG-4505, Shpg. wt. 4 lbs. **59.95**

4 Digital Frequency Counter provides economy and accuracy for measurements into the VHF range

$139.95

- **Precise frequency measurements from 10 Hz to 225 MHz**
- **Dual gate times provide decimal point positioning**
- **Complete over-voltage protection**

This precise frequency counter supplies full frequency measurement capability at an economical price. The crystal-controlled time base provides an excellent ±10 parts-per-million (PPM) long-term accuracy. Eight, large LEDs display the frequency reading directly in MHz with a high 10 Hz resolution at 225 MHz. A 0.1 second and a 1.0 second gate interval provide two measurement ranges.

A low 25 mV input sensitivity permits the use of the optional SMA-2400-1 telescopic antenna (this page) for indirect frequency measurements. A locking swing-down stand provides a choice of an alternate display viewing angle. This counter can be assembled to operate on either 110 VAC or 220 VAC at 50/60 Hz.

Kit IM-2410, Shpg wt. 6 lbs. **139.95**

IM-2410 SPECIFICATIONS: Sensitivity: 10 Hz to 50 MHz range, 25 mV RMS maximum, 10 mV typical from 10 Hz to 30 MHz, 50 mV RMS maximum from 30 to 50 MHz; 20 MHz to 225 MHz range, 25 mV RMS maximum, 10 mV typical from 20 to 150 MHz, 50 mV RMS maximum from 150 to 225 MHz. **Input Impedance:** 1 megohm, shunted by less than 24 pF. **Input Protection:** 150 VAC, up to 100 kHz—derating to 5 VAC from 160 to 225 MHz. **Time Base Frequency:** 3.58 MHz. **Setability:** ±1 PPM. **Temperature Stability:** ±10 PPM, from 0 to 40 degrees C. **Gate Time:** 0.1 or 1.0 second, switch selectable. **Frequency Resolution:** 10 Hz to 50 MHz range, ±1 Hz with gate time set at 1.0 second and ±10 Hz with gate time set at 0.1 second; 20 MHz to 225 MHz range, ±10 Hz with gate time set at 1.0 second; ±100 Hz with gate time set at 0.1 second. **Display:** Eight-digit LED display. **Overall Dimensions:** 3⅜" H x 7¼" W x 9½" D. (8.6 x 18.4 x 24.1 cm). **Net Weight:** 5 lbs. (2.3 kg).

5 Accurately measure frequencies into the UHF range

$289.95

- **Extra-wide 5 Hz to 512 MHz range for measuring frequency, period and ratios between frequencies**
- **Trigger level control ensures stable counting**
- **Proportionally-controlled crystal oven for greater frequency measuring stability and accuracy**

A multi-function counter, The Heathkit IM-2420 Counter provides the versatility and reliability for a broad spectrum of applications. Measure frequencies from 5 Hz to 512 MHz in two ranges with a resolution of as low as 0.1 Hz. With a typical sensitivity of 15 mV (25 mV guaranteed) low-level signals are measured as easily as high-level frequencies. Also measure the period of a signal between 5 Hz and 10 MHz with a display resolution as low as 100 ns. For ratio measurements an effective range of 1.6 to 1.024 x 10^8 is provided.

Other outstanding features include: an internal time base accuracy to within 0.2 PPM, standby mode, over-voltage protection, adjustable trigger and more. A rear panel jack allows the use of a higher precision time base standard. Counter has dimensions of 4½" H x 10" W x 12½"D and weighs 6½ lbs.

Kit IM-2420, Shpg. wt. 9 lbs. **289.95**
SM-2420, Assembled and tested, Shpg. wt. 9 lbs. **350.00**
SMA-2400-1, Assembled Telescopic Antenna, Shpg. wt. 1 lb. **9.95**

IM/SM-2420 SPECIFICATIONS: INPUTS: Frequency Ranges: 5 Hz to 50 MHz and 40 MHz to 512 MHz. **Sensitivity:** 25 mV RMS guaranteed, 4 to 15 mV RMS typical. **Input Impedance:** 5 Hz to 50 MHz range, 1 megohm shunted by less than 25 pF; 40 MHz to 512 MHz range, 50 ohms nominal. **Input Protection:** 5 Hz to 50 MHz range. 250 V RMS to 100 kHz (derating to 25 V RMS at 50 MHz); 40 MHz to 512 MHz, 5 V RMS. **Period Measurement Mode: Input:** 5 Hz to 50 MHz only. **Range:** 5 Hz to 10 MHz. **Display Resolution (Least Significant Digit):** 100 ns to 0.1 ms, in decade steps. **Ratio B/A Measurement Mode: Input Frequency Limits:** 5 Hz to 25 MHz and 40 MHz to 512 MHz. **Effective Measurement Range:** From 1.6 to 1.024 x 10^8 guaranteed. **Time Base: Frequency:** 10 MHz. **Setability:** To within 0.2 parts per million (PPM). **Temperature Stability:** 0.2 PPM from 32°F to 104°F (0°C to 40°C). **Crystal Aging Rate:** Less than 1 PPM per year. **Over Operating Temperature:** 167°F, ±9°F (75°C ± 5°C). **Warm-up Time From Cold Oven (unplugged) Start:** 10 minutes to within 1.0 PPM, 20 minutes to within 0.1 PPM. **External Input:** TTL or 2.5 V RMS from 50 ohm source (10 MHz). **Input Protection:** Any voltage with peak-to-peak limits between −3.5 and +10 volts. **Output:** Will drive one standard TTL (i.e. 7400) load. Short circuit protected. **General Gate Time:** 0.01 second, 0.1 second, 1 second, and 10 seconds (switch selectable). **Sampling Rate:** Every 0.1 second, 0.33 second, 1 second or 10 seconds.

6 Low-capacitance isolation scope probe

Two-position probe offers switchable direct and X10 operation for minimal loading of high impedance circuits. Features 10 megohm impedance and BNC coaxial connector with separate alligator-clip ground connector.

Kit PK-1, Shpg. wt. 1 lb. **16.95**

Use your Visa or MasterCard credit card to purchase your kit!

7 Deluxe 10:1 and direct 1:1 probe combination

This flexible probe is ideal for all frequency counter and scope uses from DC to 10 MHz when used in the X1 position and from DC to 100 MHz when in the X10 position. Has a 4 ns rise time in X10 and a compensation range of 15-50 pF. Several adaptors and probe tips are provided.

PKW-105, Assembled, Shpg. wt. 1 lb. **34.95**

IOA-3220-1, Pouch with 2 probes, Shpg. wt. 1 lb. **64.95**

8 Scope and voltmeter demodulator/detector probe

For use in IF/RF measurements, this versatile probe can be used in circuits up to 500 VDC or 30 VRMS. Optional banana plug or coax connectors.

Kit 337-C, Shpg. wt. 1 lb. **12.95**

9 RF test probe for use with DC voltmeters

Provides RF voltage measurement capability for DC voltmeters with 10 and 11 megohm input impedances. For use up to 100 MHz.

Kit PK-3A, Shpg. wt. 1 lb. **14.95**

10 30 kV DC Probe for meters with 10 megohm input

Extend the measurement capability of DC voltmeters that have input impedances of 10 megohms. This X100 accessory probe features a phono plug connector for inserting into voltmeters, alligator ground clip and molded housing.

Kit IMA-100-10, For 10 megohm input meters, Shpg. wt. 1 lb. **16.95**

SMA-100-10, Assembled, Shpg. wt. 1 lb. **19.95**

Kit IMA-100-11, For 11 megohm input meters, Shpg. wt. 1 lb. **16.95**

Power supplies to run experimental circuits plus test equipment to test and repair projects

1 Battery Eliminator handles heavy current loads

$179.95 • **Continuous 12A current output or 20A intermittent**

For any high-current usage between 9 and 15 volts DC, such as for Ham and CB radio servicing, the IP-2760 reliably supplies all your required power. When a lot of current is required, the Battery Eliminator regulator circuitry maintains less than a 2% output change under varying load conditions. Effective filtering removes AC for less than a 1% output ripple at full load. Double heat sinks allow this power supply to run cooler while its four power transistors are fused at 20 amps to protect it against overloads. Front panel meters show output voltage and current.

Kit IP-2760, Shpg. wt. 31 lbs. **179.95**

IP-2760 SPECIFICATIONS: Output Voltage: Variable from 9 – 15 VDC. **Output Current:** 12 A continuous, 20 A intermittent (per derating curve in manual). **Ripple:** Less than 1% at full load. **Regulation:** Less than 2% variation from no load to full load. **Fuses:** 7 A, 3AG slow-blow primary; 20 A, 3 AG output. **Power Requirement:** 120/240 VAC, 50/60 Hz. **Dimensions:** 5¼" H x 11" W x 11" D.

2 Tri-Power Supply features three outputs

$119.95 • **Current limiting protects outputs from short circuits**

Ideal for design or experimentation, the IP-2718 supplies the voltages and currents needed for most digital devices. A constant 5 VDC output is rated at 1.5 amps which is capable of powering most experimental digital circuits. The two variable 20 VDC outputs provide 0.5 amps each and feature a special "tracking" mode. In this mode, a preset voltage difference can be maintained between the power supplies as one is adjusted – ideal for providing + and – voltages in operational amplifier circuits. All three outputs can be operated independently from each other with either floating or referenced grounds. Or, the three supplies can be connected in series to provide up to 45 VDC or connected in parallel to supply higher current to a load. All outputs and controls are easily accessible.

Kit IP-2718, Shpg. wt. 12 lbs. **119.95**

SP-2718, Assembled and tested, Shpg. wt. 12 lbs. **200.00**

IP/SP-2718 SPECIFICATIONS: Outputs: 5 VDC at 1.5 A; Two outputs at 0 – 20 VDC at 0.5 A. **Regulation: No Load to Full Load:** <0.1% variation on 20 V supplies; <3% variation on 5 V supply. **For 10 V Line Voltage Change:** <0.2% variation on 20 V supplies; <0.2% variation on 20 V supplies; <0.15% variation on 5 V supply. **Power Requirement:** 120/240 VAC, 50/60 Hz, 100 watts at full load. **Dimensions:** 4½" H x 10¾" W x 9" D (11.4 x 27.3 x 22.9 cm). **Weight:** 10 lbs. (3.7 kg).

3 Regulated Power Supply with up to 400 VDC output

For higher voltage and tube circuits, the IP-2717A Power Supply is a convenient source of regulated power. The high voltage output provides an adjustable 0 to 400 VDC at a continuous 100 mA or an intermittent 125 mA with less than 10 mV RMS ripple and varies less than 1% from a no load to a full load condition. The bias output provides voltages from 0 to – 100 VDC at up to 1 mA.

Separate tube filament voltages of 6.3 and 12.6 VAC are also available for use as vacuum tube heater voltages or as an AC source for low voltage power supply circuits. These two outputs are rated at 2 amps and may be used at the same time if a combined power of 25 volt-amperes isn't exceeded. For the user's convenience, a separate transformer is used for the filament voltages allowing tubes to be left on while the high voltage is removed by a front panel switch.

A front panel meter monitors either high voltage or bias voltage as determined by the setting of a meter selection switch. High voltage DC current is also monitored by a 0 to 150 mA meter. The IP-2717A measures 13⅜" W x 11¼" D x 5½" H and is housed in a rugged cabinet which features insulated output binding posts.

Kit IP-2717A, Shpg. wt. 19 lbs. **189.95**

SP-2717A, Assembled and tested, Shpg. wt. 20 lbs. **250.00**

IP/SP-2717A SPECIFICATIONS: High Voltage: 0 to 400 VDC. **Regulation:** Less than 1% from no load to full load for output of 100 to 400 VDC. **Ripple:** Less than 10 mV RMS. **Output Impedance:** Less than 10 ohms from DC to 1 MHz (per manual impedance curve). **Bias Voltage:** 0 to – 100 VDC. **Filament Voltage:** 6.3 VAC and 12.6 VAC. **Power Requirements:** 120/240 VAC, 50/60 Hz.

Heathkit 5280 Series Test Equipment

4 Sine and Square Wave Audio Signal Generator

Useful in many audio applications, the IG-5282 Audio Oscillator provides sine and square wave frequencies from 10 Hz to 100 kHz in four ranges. These frequency ranges make the IG-5282 ideal as a signal source for harmonic distortion-measurements of audio amplifiers. The square wave output can also be used to trigger instruments such as frequency counters and oscilloscopes. The sine and square wave levels are independently adjustable from 0 to 3 volts.

Single circuit board construction makes this versatile audio oscillator easy and quick to assemble. The rugged cabinet can be stacked with its companion test instruments and features a handy storage compartment. The IG-5282 Audio Oscillator requires two 9-volt batteries for portable use or the IPA-5280-1 Power Supply on page 50 for operating from 120 or 240 VAC.

Kit IG-5282, Shpg. wt. 5 lbs. **59.95**

IG-5282 SPECIFICATIONS: Frequency Output: 10 Hz to 100 kHz in four ranges. **Sine Wave Output Voltage:** 0 to 3 volts RMS. **Square Wave Output Voltage:** 0 to 3 volts peak. **Dimensions:** 11" W x 5¾" H x 7¾" D (27.9 x 14.6 x 19.7 cm). **Weight:** 3¼ lbs. (1.6 kg).

5 Versatile RLC Bridge for field or bench work

• **Directly read unknown values of resistance, capacitance and inductance**

A very useful general-purpose instrument, the RLC Bridge lets you easily determine unknown values of resistors, inductors and capacitors. With the IB-5281, you can clean up that pile of unknown components that always accumulates on a test bench. It has a resistance range of 10 ohms to 10 megohms, an inductance range of 10 μH to 10 H, and a capacitance range from 10 pF to 10 μF. Terminals are provided for the use of an external standard.

A rugged cabinet houses a single and easily assembled circuit board and stacks easily. A snap-tight compartment in the cabinet stores test leads and component clip accessories. Two 9-volt transistor batteries power the IB-5281 for portable operation or the IPA-5280-1 Power Supply on page 50 for AC use on a bench.

Kit IB-5281, Shpg. wt. 5 lbs. **59.95**

IB-5281 SPECIFICATIONS: Resistance Ranges: 10 ohms to 10 megohms. **Inductance Ranges:** 10 μH to 10 H. **Capacitance Ranges:** 10 pF to 10 μF. **Oscillator Frequencies:** 1 kHz, 10 kHz, 100 kHz. **External Standard Range:** 1:1 to 10:1. **Cabinet Dimensions:** 11" W x 5¾" H x 7¾" D. **Weight:** 3½ lbs.

6 RF Oscillator aids radio and TV alignments

• **Five bands provide a wide 310 kHz to 110 MHz range of frequencies**

The portable IG-5280 provides an accurate source of amplitude modulated and unmodulated RF signal for aligning tuned stages in AM, FM and television receivers. The RF Oscillator's output is divided into five overlapping bands covering AM, FM, TV, longwave and shortwave broadcasting. A large easy-to-read dial scale indicates RF frequencies. Calibrated harmonics allow the usefulness of the IG-5280 to be extended up to 220 MHz. A built-in 1 kHz oscillator provides modulation for the RF signal and serves as a convenient audio signal source. Operates on two 9 V batteries or uses the IPA-5280-1 AC power supply on this page. Cabinet has a convenient storage compartment and stacks easily.

Kit IG-5280, Shpg. wt. 5 lbs. **59.95**

IG-5280 SPECIFICATIONS: RF Output: Frequency Range: 310 kHz to 110 MHz. 100 to 220 MHz on harmonics. **Output Voltage:** 100 mV approx. **Internal Modulation:** 1000 Hz. **AF Output:** Frequency: 1000 Hz Voltage: 2.0 volts RMS (open circuit). **Dimensions:** 11" W x 5¾" H x 7¾" D. **Weight:** 3¼ lbs.

7 Helpful Signal Tracer checks radio/TV circuits

• **Audible ohmmeter/voltmeter function works as a useful logic tracer**

Simple, yet effective. The IT-5283 Signal Tracer is an ideal troubleshooting instrument for use in radio and TV circuits. Included with the kit is a diode-equipped RF probe which lets you quickly trace receiver and transmitter circuits to reveal component and RF or IF stage failures. Turn the probe to the DC position for tracking down problems in all types of audio circuits. Set the IT-5283 to the audible volt/ohm position and voltages and resistances can be checked by simply listening to an audible tone. Or, check out logic circuits using a tone. Operates on two 9 V batteries or from the IPA-5280-1 on this page.

Kit IT-5283, Shpg. wt. 5 lbs. **59.95**

IT-5283 SPECIFICATIONS: Functions: Substitute speaker, AF signal tracing, RF signal tracing, Audible volt/ohmmeter. **Speaker:** 3" permanent magnet. **Dimensions:** 11" W x 5¾" H x 7¾" D (27.9 x 14.6 x 19.7 cm). **Weight:** 3 lbs. (1.4 kg).

AC Power Supply for all 5280 Series Instruments

The IPA-5280-1 Power Supply simultaneously supplies a regulated + and – 9 volts DC to all the 5280 Series instruments from a selectable 120 or 240 VAC. The supply has dimensions of 6" H x 3¾" W x 3" D and weighs 1¾ lbs.

Kit IPA-5280-1, Shpg. wt. 3 lbs. **39.95**

Credit Card Orders call TOLL-FREE: 800-253-0570. Alaska and Michigan Residents Call: 616-982-3411.

8 Lab-grade Portable Real-Time Spectrum Analyzer

- **Use it anywhere, even in your car – operates on six "C" batteries**

An impressive value: As the world's first hand held, microprocessor-controlled ½- and 1-octave Real-Time Spectrum Analyzer, Heath's AD-1308 is a breakthrough in uncompromising mobile capability. It has comparable specs and more features than many units costing thousands of dollars.

Sounds you can see: The AD-1308 displays line input or acoustic-pickup spectral response and sound pressure level, making it possible to optimize your entire audio system. The AD-1308 features 1 or 3 dB scaling for accurate setups.

Five memories let you store and recall responses for instant comparison, plus an exclusive Difference mode displays the difference between any two sources. A thumbwheel attenuator selects the scaling in 10 dB steps from 50 to 120 dB SPL, with standard ANSI fast, slow or peak response modes and A or C weighting for precise SPL or 'noise exposure' measurements.

Kit AD-1308, Shpg. wt. 5 lbs. **299.95**

SAVER! ADS-1308, Save $69.90 on this system which includes AD-1308 Spectrum Analyzer, ADA-1308-1 Power Supply/Rack Mount Accessory and AD-1309 Pink/White Noise Generator, 27 lbs. Separately $469.85 **System Price 399.95**

AD-1308 SPECIFICATIONS: SPL and Spectrum Analyzer Display Range: 23-126 dB SPL. **SPL Accuracy:** ±1 dB A-weighted. **Microphone Self-Noise Level:** <36 dB SPL. **A and C Weighting Filters per ANSI:** SI.4-1971 (Rev. 1976). **Fast and Slow SPL Response per ANSI:** SI.4-1971 (Rev. 1976). **Flatness on Direct Input:** ±1 dB. **Input Impedance:** >10k ohms. **Input Sensitivity, 90 dB SPL Range:** 0 dB = 350 mV RMS ±10%. **Power Requirements:** 10.5 V, ±10% @ 425 mA. **Low Battery Indications:** 6 V ±5%.

9 Power Supply/Rack Mount Accessory

Affords the best way to install and power your AD-1308 in Heath rack mount cabinets, charge the batteries when using nickel-cadmium batteries for portable power, and couple your system's audio signals to the Analyzer. Sturdy 9-pin D-connector permits unit to easily "snap" in and out. Has paralleled phono jacks for each channel. Left, Right, L + R or L − R signals can be selected and displayed.

Kit ADA-1308-1, Shpg. wt. 8 lbs. **119.95**

10 Accurate Pink/White Noise Generator

The AD-1309 supplies audio energy with the precise frequency characteristics to properly make measurements with real-time or swept-filter spectrum analyzer – at a fraction of the cost of comparable generators. It features front panel phono plug outputs and rotary power level control. Operates on one 9 VDC battery.

Kit AD-1309, Shpg. wt. 2 lbs. **49.95**

11 Regulated Low-Voltage DC Power Supply

An ideal low-voltage supply, the IP-2728 furnishes a regulated 1 to 15 volts DC up to 500 milliamps. It has a continuously variable output with less than 5 mV ripple and noise. This convenient power source has fully adjustable current limiting from 10 mA to over 500 mA. A three-terminal floating output enables either positive or negative voltage outputs. Programming terminals on the rear panel allow AC or DC voltage control of the IP-2728's voltage output. This handy power supply has dimensions of 4⅜" H x 5½" W x 5¾" D.

Kit IP-2728, Shpg. wt. 5 lbs. **49.95**

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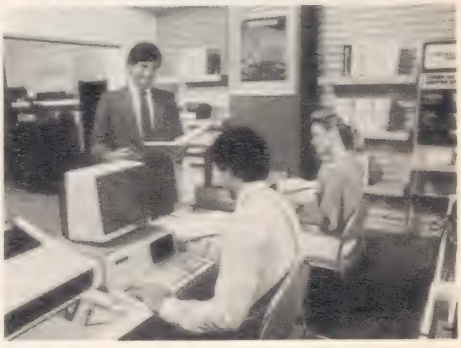

The Kit Center

The place to discover hundreds of world-famous Heathkit® products, all backed with the promise, "We won't let you fail." You'll see many new, interesting electronic kits to build and learn from, while you save money. There are new ideas for home, business and hobby in this very large and important part of our new stores.

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1 Deviation Meter accurately shows FM output

$179.95

- **Quickly check the frequency modulated output of transmitters and signal generators**
- **Low pass filter assists in eliminating high-frequency noise at lower modulation frequencies**

Measure the peak deviation (frequency modulation) of transmitters and signal generators whose carrier frequencies are between 25 and 1000 MHz with the IM-4180 FM Deviation Meter. Four pushbutton switches select modulation ranges from 2 to 75 kHz with coarse and fine tuning controls for locking in difficult UHF FM signals. Monitor a line directly or use an optional antenna.

Added features include selection of correct de-emphasis for audio signals and a switch-enabled internal battery level check. Connect an 8-ohm speaker or headphones for audio monitoring. Front panel oscilloscope jacks enable you to observe signal waveshapes. Level controls are provided for adjusting meter sensitivity and audio output. Powered by ten AA batteries. 5½" H x 10⅜" W x 4¼" D.

Kit IM-4180, Shpg. wt. 7 lbs. **179.95**
Kit IMA-4180-1, Battery Charger/Eliminator, 2 lbs. ..... **Now 29.95**
SMA-2400-1, Swiveling Telescopic Antenna, Shpg. wt. 1 lb. **9.95**

2 Precise pulse signals from 1 Hz up to 5 MHz

$149.95

- **Generates a range of pulses at three separate outputs**
- **Independent control over pulse period, width and delay**
- **Indicator warns of overlapping width and period settings**

An essential instrument for digital and pulse applications, the IG-1277 Pulse Generator produces pulse repetition periods from 200 ns to 1 s (5 MHz to 1 Hz) with separate pulse width and delay ranges from 100 ns to 1 s in seven decade ranges. All ranges are continuously variable using 1-decade vernier range controls. **Three separate outputs, with fast rise/fall times.** The 50-ohm output offers an adjustable DC offset with an open circuit output range from 0.2 to 20 volts P-P including a rise/fall time that is less than 15 ns for a 5 volt level change. The TTL output drives up to ten loads using a fixed level for a logic "0" of less than 0.4 V and a logic "1" of greater than 2.4 V with a rise/fall time less than 25 ns. The third output can be used either to trigger an oscilloscope or to drive up to 3 TTL loads using the same logic levels as the TTL output.

Additional features include a manual trigger pushbutton switch. It allows you to generate a single pulse to operate a circuit at a slow rate. An overlap indicator warns that a selected pulse width is longer in time than the pulse period setting.

The Pulse Generator is a versatile and easy-to-use instrument with clearly labeled front panel switches and controls. It can generate virtually any pulse signal you may require in a design laboratory, a service shop, or in your home hobby shop. Its overall dimensions are 3¾" H x 10" W x 12½" D and weighs 7 lbs. It operates on 110 VAC at 60 Hz, 30 watts.

Kit IG-1277, Shpg. wt. 9 lbs. **149.95**

3 Sine and square wave signals up to 100 kHz

$149.95

- **Generates high quality sine wave signals with less than 0.1% distortion for testing audio amplifiers**
- **Sharp, clean square waves are ideal for checking frequency responses and testing digital instruments**

Designed for service and testing, the IG-5218 generates sine waves from 1 Hz to 100 kHz and square waves from 5 Hz to 100 kHz. The sine wave open-circuit output, with less than 0.1% distortion, is adjustable through eight ranges from 0.003 to 10 VRMS and is monitored by a front panel meter. The sine wave output will drive 600 Ω loads up to the 1 VRMS range and has a switchable internal load. The separate square wave output has a 50 ns rise time and is available in three ranges up to 10 V peak-to-peak. Both sine and square wave frequency outputs are identical with each being independently adjustable. Use both outputs simultaneously or independently.

This highly reliable generator uses 110/220 VAC, 50/60 Hz. Has dimensions of 5⅛" H x 13¼" W x 7" D (12.8 x 33.1 x 17.5 cm) and weighs 7 lbs. (3.3 kg).

Kit IG-5218, Shpg. wt. 10 lbs. **149.95**

Precision instruments for accurate work or home testing, troubleshooting and servicing

4 Rugged, accurate bench-type VTVM for the shop

- **Wide 6-inch meter allows precise incremental measurements**

The IM-5228 Vacuum Tube Voltmeter is designed for use by servicemen, engineers, maintenance people and by the hobbyist. It is simple, rugged and accurately measures ±DC and AC voltages, and resistances with the reliability required of a dependable high-use voltmeter. It measures ±DC voltages in seven ranges from as low as 1.5 volts to 1500 volts with a full scale accuracy of ±3%. With an accuracy of ±5%, you can measure AC voltages also in seven ranges from a low 0 to 1.5 volts RMS range up to the highest scale of 1500 volts RMS. Resistances are measured from 0.1 ohm to 1000 megohms, also in seven ranges.

Combination AC-OHMS-DC switching test probe plugs into a single front panel jack that also includes the ground lead. The VTVM's high 11 megohm input impedance doesn't significantly load circuits under test. A convenient center scale is provided for use in making null adjustments. A handy db scale is also provided for tests made with audio equipment.

The IM-5228 VTVM's gimbal bracket enables you to mount the meter almost anywhere. The meter requires one "C" size battery, as well as 110 or 220 VAC, 50/60 Hz at 10 watts. Dimensions are 5" H x 12¾" W x 4¾" D and weighs 5 lbs.

Kit IM-5228, Shpg. wt. 6 lbs. **89.95**

PKW-4, Assembled Replacement Probe for IM-5228, Shpg. wt. 1 lb. **19.95**

5 Function Generator supplies three basic waveforms

- **Sine, square and triangle waveforms from 0.1 Hz to 1 MHz**

This versatile instrument supplies the basic sine, square and triangular waveforms needed for servicing electronic equipment or for driving experimental projects. These three different waveforms are produced over a frequency range from 0.1 Hz to 1 MHz. This wide range is divided into six frequency range segments set by a front panel multiplier switch. Each range is variably controlled by a front panel dial that adjusts the output frequency over a 100 to 1 ratio.

A front panel BNC-type output jack supplies a 10 volt peak-to-peak signal into a low impedance 50-ohm load (20 volts peak-to-peak into an open circuit). A calibrated attenuator, adjustable in 10 dB steps from 0 to 50 dB, decreases the output of the generator in six steps. A variable attenuator provides a 0 to 20 dB of additional attenuation of the output signal.

Compact and lightweight, this function generator takes up very little room on your workbench and can be easily carried to wherever you want to use it. With its handle removed, the generator measures 8⅞" D x 7¼" W x 3" H and weighs 4¼ lbs. Can be wired for either 120 VAC or 240 VAC at 50/60 Hz.

Kit IG-1271, Shpg. wt. 7 lbs. **169.95**

SG-1271, Assembled and tested, Shpg. wt. 6 lbs. **250.00**

6 Compact, battery-powered utility voltmeter

- **Features accuracy and simplicity in a general purpose meter**

An ideal first project for the beginner in electronics. This solid-state utility voltmeter takes only one or two evenings to assemble, is easy to operate, and can be used on hundreds of other projects, as well as around the home. It features four ±DC and AC voltage ranges from 1.5 volts DC (1.7 volts AC) up to 500 volts (DC accuracy is ±3% of full scale, AC accuracy is ±5% of full scale), and four ohmmeter ranges up to x1 megohm. A wide-band frequency response on the AC ranges covers the full audio frequency range and beyond. A low 1.5 VDC used on the ohmmeter ranges allows safe semiconductor checking.

Test leads are built into the meter's case which has overall dimensions of 9⅜" W x 5⅜" H x 9" D (23.8 x 13.7 x 22.9 cm). It weighs 2 lbs. (0.9 kg). Requires two 9-volt transistor batteries and one 1.5 volt "C" cell.

Kit IM-5217, Shpg. wt. 4 lbs. **49.95**

7 40 kV high-voltage probe with built-in meter

- **Convenient probe for fast and easy high-voltage checks**

Self-contained probe measures extremely high positive voltages up to 40,000 volts (negative ground) with a full-scale accuracy of ±3%. Directly read all voltage measurements on the built-in meter for fast and easy operation. This easy-to-assemble kit can be put together in one evening. Dimensions: 1½" H x 1⅞" W x 15" L and weighs only 8 ounces.

Kit IM-5215, Shpg. wt. 2 lbs. **34.95**

8 Add kilovolt measuring capability to your meter

- **Increases a voltmeter's DC measuring capability by a factor of 30**

Use this accessory probe to extend the DC voltage measuring range of any 10-megohm input digital multimeter up to 30,000 volts. Molded case houses a precision 2% resistor. Probe uses a banana plug connector.

Kit IMA-100-10, Shpg. wt. 1 lb. **16.95**

SMA-100-10, Assembled and tested, Shpg. wt. 1 lb. **19.95**

9 Handy tester quickly locates phone problems

$19.95

- **Verifies basic telephone functions and phone line polarity, plus ring and line voltage levels**
- **Checks condition of telephone line cord**
- **No batteries to replace; no external power required**

Check your home phone lines at your convenience with this handy Telephone Line Analyzer. It is easy to operate and can save you the cost of an unnecessary and expensive telephone company service call. It simply plugs into any modular phone jack and provides a fast indication of telephone line properties that affect the operation of any home or office phone.

With this handy tester, check your home telephone line for defective devices or too many phone products that could be loading down the phone line. After putting in a new extension line, check your do-it-yourself wiring for improper loading or shorts. With this useful device you can even verify the condition of the phone line from the central office to the phone jack in your home.

Uncover other hard-to-find problems with the Analyzer such as reversed polarity which can cause polarity-sensitive telephone equipment to operate improperly. Even check a phone's detachable coiled cord to make certain that it is working properly. The Line Analyzer accepts all RJ-11 type plugs.

The Telephone Line Analyzer is a phone-line powered tester that needs no batteries or external power. It is completely safe to use on your telephone line. And its compact size, 2¾" H x 5" W x 1½" D (7 x 12.7 x 3.8 cm), allows you to store it almost anywhere. The Analyzer weighs only 7½ ounces (0.2 kg).

ST-2204, Assembled and tested, Shpg. wt. 1 lb. **19.95**

10 Versatile 5-range clamp-on AC ammeter

$49.95

- **A rugged electrician's tool for testing electrical and lighting circuits, as well as balancing power circuits**
- **A homeowner's aid for checking appliance current usage and testing of AC circuits, motors and more.**
- **Pointer lock switch lets you freeze meter reading before removing the meter from the conductor being checked**

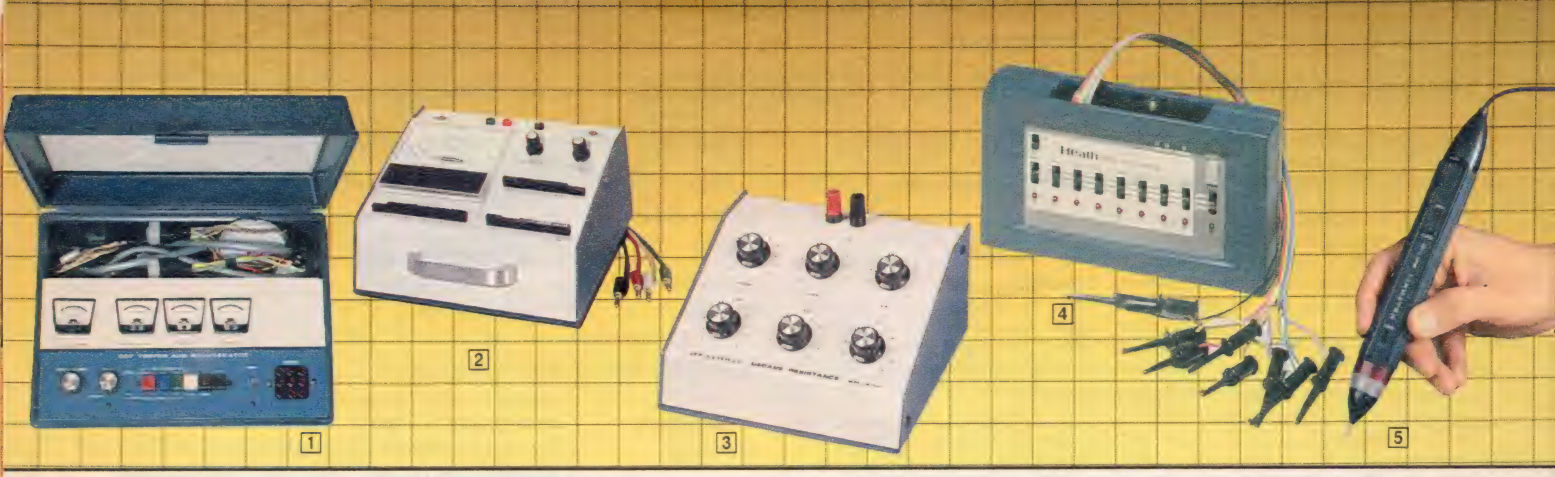
Really easy to operate, this Clamp-On Meter measures 50 and 60 Hz current flow in circuits or appliances by simply clamping its inductive pickup around a conducting AC wire. You don't need to break the line you are checking. Five current ranges of 6A, 15A, 60A, 150A and 300A allow monitoring of almost any AC circuit. For checking AC voltages, the meter has three ranges of 150V, 300V and 600V. A resistance range of 0 to 5 kilohms is also available for such uses as circuit continuity checks, and other home and shop resistance measurements.

A handy finger-operated pointer lock switch enables you to easily make hard-to-reach one-handed current measurements. Just snap the meter's inductive pickup around the wire you want to check, press the pointer lock switch with your finger, then remove the meter from the circuit—all with one hand. The AC current flow in the circuit can now be read, safely and accurately, directly from the clearly marked scales while the pointer is still locked into position. Press the lock switch again and the pointer is released, ready to take another measurement.

A rugged shock-resistant housing enables this meter to perform reliably under the constant use of an electrician on the job or after banging around in a homeowner's tool box waiting to be used. The meter's movement is also protected by the pointer lock-down switch. Single-switch operation also makes the meter more reliable with less parts to malfunction and easier to operate with less chance of incorrect function selection.

The Clamp-On Meter comes ready to use. It is assembled and tested so you can use it as soon as you take it out of the box. It comes with a set of test leads, a 1.5 V "AA" battery, a handstrap to prevent accidental drops, a spare resistance range fuse and carrying case. This is one meter that is sure to get a lot of use around the house.

SM-2206, Assembled, Shpg. wt. 2 lbs. **49.95**



1 Checkout and rejuvenate virtually any TV CRT

A must for every TV shop, the IT-5230 CRT Tester and Rejuvenator offers pushbutton control of separate testing, cleaning and rejuvenation of almost all current color and B/W television picture tubes, even in-line-gun tubes. Each gun is individually controlled and monitored on its own grid current meter.

From the front panel you can precisely set CRT heater voltages, check for shorts and possible gassy conditions. After rejuvenation, a separate cleaning process is applied to the guns to ensure proper tube operation. A special pushbutton provides a good indication of the life expectancy of the CRT. Included is a 4-foot heavy-duty test cable and four adapter sockets with instructions for assembling optional sockets. This tester operates on 120/240 VAC. The IT-5230 Tester has dimensions of 5½" H x 13½" W x 10" D and weighs 7.7 lbs.

Kit IT-5230, Shpg. wt. 9 lbs. **149.95**

CRT Socket Adapter allows you to test even more CRTs on the IT-5230. Uses universal clip leads to hook up and test CRTs with known basing configurations.

ITA-5230-1, Shpg. wt. 1 lb. **29.95**

2 Portable FET/Transistor Testor quickly and accurately checks devices in- and out-of-circuit

- **A quality instrument for checking semiconductor devices**
- **Large easy-to-read meter clearly shows tested values**

This highly accurate instrument tests transistors, diodes, FETs, SCRs, triacs and UJTs in- and out-of-circuit. Easy-to-read meter clearly shows the actual operating characteristics of a device (gain, transconductance and leakage current), not

Personalize your kits with a stylish, burnished brass Name Plate

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Move with Heathkit into the rapidly growing

6 Explore EPROM programming techniques

$369.95

- **Program, duplicate, verify and simulate EPROMS quickly and inexpensively; all under microprocessor control**
- **Accommodates 2500 and 2700 series EPROMs**
- **Transmit EPROM code to or receive data from a computer**

The versatile ID-4801 EPROM Programmer provides computer enthusiasts and advanced electronics hobbyists with an inexpensive instrument to further their knowledge and work in computer programming applications. The ID-4801 Programmer can be used to program, duplicate, verify, and simulate EPROMs that use a single power supply. These include popular 2500 and 2700 series EPROMs and other compatible devices up to 16K bytes. This easy-to-assemble programmer kit also provides engineers with a cost-effective method of quickly programming a small number of EPROMs for prototypes and specialized purposes.

Ten distinct functions can be selected using the EPROM Programmer's 4 x 4 HEX keypad and six control keys. Select a RAM memory location, enter or examine data, and increase or decrease the displayed memory address by one. You can also repeat data being entered for duplicating entire blocks of data without tiresome repetitive keystrokes. After your data is entered into the programmer's RAM memory you transfer it to a selected device using the Program EPROM Mode.

Save development time and avoid the need to repetitively program EPROMs. Use the programmer's RAM to emulate EPROMs or ROMs in external devices. Con-

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Yes, I'd like my friends to know I handcraft my kits with special care and pride. Please send _____ solid brass name plate(s) with my name engraved on them. Enclosed is $ _____ ($2.00 for one plate or $1.60 each, for two or more) which covers first class postage and handling.

Please print name plainly in capital letters using a maximum of 14 characters (including spaces) in the boxes provided below.

Name: _____

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City: _____ State: _____

GDP-1225 Zip: _____

Increase your testing and servicing capability with these economical Heathkit instruments

merely a "good/bad" rating. This tester features pushbutton control plus an internal battery check. Use either the color-coded test leads or built-in sockets. It is powered by two 1.5 VDC "D" cells (not included). Dimensions are 5¼" H x 8½" W x 8⅝" D (13.1 x 21.2 x 21 cm) and weighs 3½ lbs. (1.6 kg).

Kit IT-3120, Shpg. wt. 5 lbs. **99.95**

3 Laboratory-grade 6-switch Decade Resistance Box

- **Has a wide range of resistance values for all types of work**
- **Rugged housing holds up to heavy test and work bench use**

The Heathkit IN-3117 Resistor Substitution Box kit provides resistance values from 1 ohm to 999,999 ohms in 1 ohm steps. All resistors are precision 1 watt, 0.5% tolerance type. Zero setting bypasses resistor box. The rugged 5" H x 7½" W x 6⅝" D (12.5 x 18.8 x 16 cm) metal case features two binding posts for easy test setups. The Decade Resistance Box weighs 2½ lbs. (1.1 kg).

Kit IN-3117, Shpg. wt. 3 lbs. **69.95**

4 Versatile Byte Probe speeds troubleshooting

- **A unique test instrument for checking lines and circuitry**
- **Compact and portable; ideal for in-the-field use**

Use this unique eight channel Byte Probe to test the logic states (up to 10 MHz) of address lines, data lines and other general TTL or CMOS circuitry that operates from a +5 VDC power supply. Each channel is switch-selectable, low-"don't care"-high, with highs indicated by a red LED. When input signals match switch settings the Probe sends out a trigger signal to a scope for in-depth real time waveform analysis. Observe actual data on a scope in real time, pulse stretch, or latched mode. Several Probes can be hooked together to allow multiple connections for testing of more than eight lines; also used to trigger scopes and other test equipment. Powered by either a 9-volt transistor battery or an optional PS-2350 Battery Eliminator located on page 46.

Kit ID-4804, Shpg. wt. 2 lbs. **69.95**

5 Logic Probe indicates HIs/LOs in TTL/CMOS circuits

$39.95

- **Separate indicator lights show logic "1" and "0" levels**
- **Memory function detects and indicates a change in levels**
- **Powered from circuit under test or a separate supply**

Quickly and easily check any TTL or CMOS circuit. This handy probe detects and indicates high and low logic levels in 5 VDC TTL circuits up to 100 MHz and 15 VDC CMOS circuits up to 80 MHz. The probe will also indicate intermediate or "bad" logic levels. The presence and polarity of single pulses as short at 10 ns duration will also be indicated. A memory LED turns on whenever a change takes place in the state of either logic level.

Two indicator lights are located at the tip of the probe for a clear view of what is happening without removing your eyes from the test point. Power is provided to the logic probe from the circuit under test through 34" leads with built-in strain relief and color-coded mini-clips. Detachable ground clip included.

The logic probe is insulated and features probe tip protection to a momentary +175 VDC and power lead protection to a continuous −25 VDC or +25 VDC (17 VAC) for one minute. The probe is a compact 9¼" long x 1" diameter (23.1 x 2.5 cm) and is a lightweight 2½ ounces (71 g).

Kit IT-7410, Shpg. wt. 1 lb. **39.95**

IT-7410 SPECIFICATIONS: DC THRESHOLD LEVELS: TTL Logic ZERO: 0.8 ± 0.15 @ 5 VDC. **TTL Logic ONE:** 2.1 ± 0.25 @ 5 VDC. **CMOS Logic ZERO:** 30 ± 10% of supply voltage. **CMOS Logic ONE:** 70 ± 10% of supply voltage. **INPUT IMPEDANCE:** 400 k ohms in parallel with 10 pF. **RESPONSE LIMIT:** 10 ns for single pulse or train for TTL and CMOS.

and highly interesting field of programming and reusing EPROMs

nect an appropriately wired cable between the ID-4801's program socket and the socket of the ROM that is to be emulated. Test-run and modify your program until it is ready for error-free operation. Then load an EPROM with your fault-free program and place it into the external device.

Built-in editing features make this programmer an effective debugging tool. From the keypad, two separate modes let you insert and delete data from the displayed memory address. And a one- or two-byte Search Mode can be used to locate data bytes in RAM and then display both the data and the memory address.

EPROMs are prechecked before being programmed in the Program Mode. Before programming, the ID-4801 automatically tests the EPROM to make sure the selected address is blank. As data is entered in each address it is also compared to the same RAM address for error-free programming.

Data can also be loaded from an existing EPROM into the Programmer's RAM memory using the EPROM to RAM Mode. After each data byte is transferred into RAM it is compared to the same EPROM address to check for valid data entry. Then use the programmer's editing functions to revise data as desired. You can also use the Verify Mode to load a program into the programmer's RAM and then compare it to one or more EPROMS. This mode produces an identifying check sum signature that is unique to every program.

Transmit or receive data between the Programmer and most computers, microprocessor development systems, and other compatible instruments through an RS-232C port. This port is a 25-pin D connector and allows the transfer of data in an INTEL HEX format at a rate of 9600 baud.

Specific personality modules, wired by the user, are required for use in some modes for different EPROM configurations. Two blank personality modules are supplied with the programmer kit along with commonly used wiring diagrams. Extra modules are available as an accessory.

The ID-4801 EPROM Programmer is equipped with a 4K x 8 system ROM and 2K x 8 system RAM that can be expanded up to 16K with optional expansion accessories. Six LEDs indicate function selections while six 7-segment LEDs display addresses, data, and operation prompts. Uses 120 VAC at 60 Hz.

Kit ID-4801, Shpg. wt. 11 lbs. **369.95**

NEW! SD-4801, Completely assembled and tested EPROM Programmer ready for you to use right out of the box and it includes a fully loaded 16K of RAM user memory. Also included with this programmer are assembled personality modules configured for use with 2532, 2516/2716, 2732, 2732A, 2764, 2764A, 27128, and 27128A EPROMS.
Shpg. wt. 10 lbs. **525.00**

Kit IDA-4801-1, Personality Module Accessory, contains five personality modules plus labels, Shpg. wt. 1 lb. **19.95**

Kit IDA-4801-2, 8K RAM Expansion Accessory, contains additional RAM to expand the Programmer's memory up to 8K bytes, Shpg. wt. 1 lb. **19.95**

Kit IDA-4801-3, 16K RAM Expansion Accessory, contains additional RAM to expand the Programmer's memory up to 16K bytes, requires previous installation of IDA-4801-2 Accessory, Shpg. wt. 1 lb. **39.95**

NEW! SDA-4801-10, User-friendly software for all Heath/Zenith computers, IBM PC and its compatibles to upload or download binary, text, and Intel-Hex files to the ID-4801 Programmer. Does offset loading and relocation offset loading for EXE-type files. Uses MS-DOS. Shpg. wt. 1 lb. **49.95**

ID-4801 SPECIFICATIONS: Programmed Devices: 2500 and 2700 series and compatible devices to 16K bytes that use a single power supply. **Personality Module:** Two user-wired blanks provided. **Features:** Keypad entry to RAM (stand-alone operation). EPROM to RAM download (address selectable). EPROM Simulation using programmer ROM. Displays 16-bit check sum. EPROM test before programming start. Edit with insert byte, delete byte, search for byte and display address, and verify (EPROM To RAM comparison). **Input/Output Formate:** Intel Hex. **Data Transfer Rate:** 9600 baud. **Processor:** Z-80 CPU. **Clock Speed:** 2 MHz. **Memory:** 4K x 8 system and 2K x 8 system RAM expandable to 16K x 8. **Display:** Six 7-segment LEDs for address, data, and prompt. Six LEDs for function indicators. **Keys:** 4 x 4 Hex keypad. Address, Increment, Decrement, Repeat, Function Select, and Load Function Keys. **Programming Time:** 50 ms per byte. **Dimensions:** 15¾" W x 10¾" D x 4¾" H. **Weight:** 6 lbs.

7 Save dollars, erase EPROMs to use again and again

$59.95

- **Erase all untraviolet erasable integrated devices**
- **Has tray interlock system for increased safety**
- **Fast and easy one-evening project; easy to use**

Cut your EPROM Costs with the Heathkit ID-4803 EPROM Eraser. It will erase all 24- 28- and 40-pin ultraviolet erasable read only memory devices and other ultraviolet erasable integrated devices for you to use over and over again. This economical eraser is a money saver for all computer or electronics hobbyists interested in EPROM programming. Place EPROMs into the locking tray and wait for them to be erased. A safety interlock system prevents accidental exposure to ultraviolet rays whenever the tray is opened.

This compact eraser has dimensions of 2½" H x 3¼" W x 13¼" L (6.4 x 8.1 x 33.8 cm) and weighs 3½ lbs. (1.5 kg). Uses 110 volts AC, 60 Hz at 10 watts.

Kit ID-4803, Shpg. wt. 4 lbs. **59.95**

NEW SD-4803, Assembled EPROM Eraser, Shpg. wt. 2 lbs. **100.00**

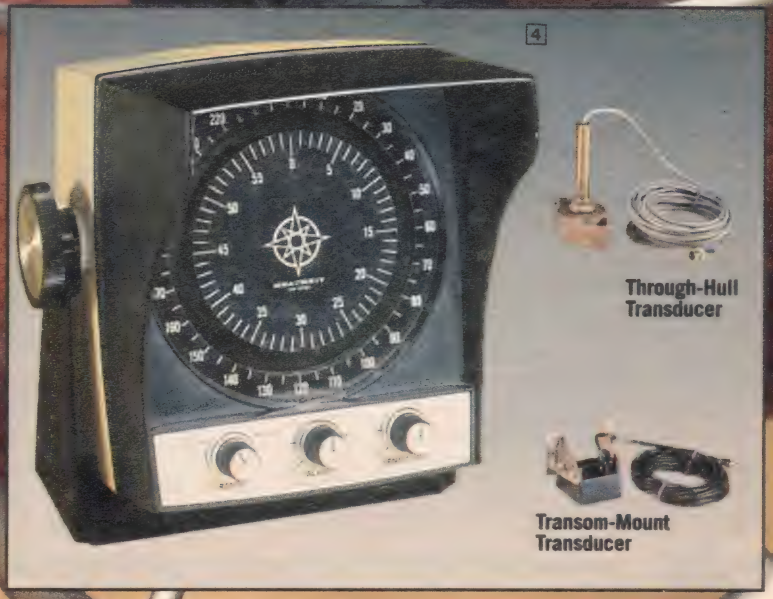
Summer boating and fishing are even more enjoyable with Heath Marine Instruments

1

3

2

5



4

Heath precision marine instruments add new pleasure to boating and fishing

1 Gain an edge in commercial and sport fishing with an advanced Video Fish Recorder

For as little as **$349.95**

- **See below your boat down to 480 feet using eight selected depth ranges**
- **Designed for simple and easy installation**
- **Alerts you to a strong fish echo or a rising bottom**
- **Four distinct shades of gray illustrate bottom conditions as well as the presence of fish**
- **A freeze position holds the image for analysis**

Make your fishing ventures a lot more enjoyable and successful with the sophisticated MIP-2915 Video Fish Recorder. On its 5½" high contrast, anti-glare screen appears a vast amount of information besides a picture of the bottom and any fish in between.

A range scale divides the display with dashed lines into one of eight selected depth regions: 0-30,' 30-60,' 60-120,' 0-120,' 120-240,' 0-240,' or 240-480.' Depth selection can be easily determined through the use of two range switches on the front of the unit.

Also displayed on the screen are movable bar indicators that show the position of both the bottom and surface alarms. You select the maximum and minimum depth levels to warn you of a rising bottom or a strong fish echo. Four distinct shades of gray illustrate bottom conditions as well as the presence of fish so you always have a complete picture of underwater conditions. A brightness control adjusts the screen for varying light conditions.

The Video Fish Recorder also features an adjustable sweep speed for a broader or more condensed image while a freeze position holds the image for analysis. A gain control adjusts the Video Recorder's sensitivity where needed.

The MIP-2915 includes a transom-mount transducer with 25' cable and bracket. Its five pound weight and compact 6" H x 7½" W x 7¼" D size enable the Recorder to be placed almost anywhere. Operates on +12 VDC and comes with a power cable. Manufactured for Heath Company by IMPULSE.

MIP-2915, Assembled with Transom-Mount Transducer, 8 lbs. **349.95**
MIP-2914, Assembled with Through-Hull Transducer, 8 lbs. **369.95**

2 Automatic, dual-range Digital Depth Sounder has five selectable alarm depths for added safety

Low as **$179.95**

- **Detects changes in depth from 2 to 499 feet**
- **Alerts you to depth changes audibly and visually**
- **Built-in, adjustable keel offset for greater accuracy**
- **Automatic night light so you can always see the display**

Pays for itself if it sounds the alarm just once! The dual-range Digital Depth Sounder is a gread aid for coastal navigation. This unit features self-adjusting range selection that monitors the water's depth from 2 to 499 feet. The Digital Depth Sounder also has a self-adjusting gain for accurate depth readings in either fresh or salt water.

Big, easy-to-read LCD display with automatic night light shows depths in 0.1' increments to 9.9' and 1' intervals from 10' to 499.' A crystal oscillator updates depth readings every 0.9 seconds.

The Depth Sounder has five alarm settings at 2,' 4,' 10,' 20,' and 40.' A built-in keel offset automatically subtracts displacement hull depths for exact depth readings. The MI-2916 is made from weather-resistant materials. It operates on 12 volts DC. Measures 7" wide x 2½" high x 5½" deep without gimbal mount bracket.

Kit MI-2916-1, Depth Sounder with Through-Hull Transducer, 8 lbs. **189.95**
Kit MI-2916-2, Depth Sounder with Transom-Mount Transducer, 7 lbs. . **179.95**
Kit MI-2916-3, Depth Sounder with Flush-Mount Transducer, 8 lbs. **199.95**

3 Use the Remote Depth Sounder repeater station to bring readings and alarms to any area in your boat

$69.95

- **Independent alarms and depth settings**
- **Same type of display and accurate calibrations as the MI-2916 dual-range Depth Sounder**
- **Warns you with visual and audible alarms**

Place the Digital Remote Depth Sounder unit in your boat's cabin, flying bridge, or any other location on board. It provides an additional depth reading station that audibly and visually warns you of unexpected changes in depth.

This remote has the same depth display characteristics, alarm settings, keel-offset control and all weather construction as the MI-2916 described above. It differs in that the alarm and depth setting on this remote can be set independently for the depth warning and keel setting on the MI-2916.

A 25 foot connecting cable carries power and depth sounder signals from the MI-2916 Digital Depth Sounder (above) to the remote unit for accurate depth readings and easy placement anywhere.

Kit MI-2917, Shpg. wt. 4 lbs. **69.95**

4 Deluxe Dual-Range Depth Sounder adds a measure of safety to your boating enjoyment

$119.95

- **Navigate safely and protect your hull from damage with the Dual-Range Depth Sounder**
- **High pitched alarm warns you – there's no need to continuously monitor the readings**
- **Two ranges let you monitor depths to 60' or 240'**
- **Sensitivity control helps you tell the difference between bottom readings and those returned by schools of fish**

Whether you're fishing, cruising or scuba diving, this Dual-Range Depth Sounder adds an extra measure of safety to boating season pleasure. When selected, a high-pitched beeping alarm alerts you to shoals or submerged objects projecting above any preset depth from 5 to 240 feet, thus eliminating the need for continuous visual monitoring.

Two ranges, one for depths to 60 feet, and one for depths to 240 feet, provide extremely accurate readings instantly. Underwater objects located above a preset depth trigger a bright neon flash alongside the perceived depth from the object on one of two circular scales.

In addition to its use as a fine navigational instrument, a sensitivity control aids in discriminating between bottom readings and those returned by single or schools of fish.

The unit is housed in a water-resistant, black case which has a glare-free bezel with sun shield and super bright neon indicator to make depth reading easy day or night. The gimbal mount and quick disconnect power and transducer leads allow for easy removal when your boat is not in use. The Depth-Sounder is powered by your boat's 12 VDC battery.

Depth Sounder with through hull transducer and 25 feet of connector cable.
Kit MI-1301-1, Shpg. wt. 8 lbs. **119.95**

Depth Sounder with transom-mount transducer and 25 feet of connector cable.
Kit MI-1031-2, Shpg. wt. 8 lbs. **119.95**

5 Sensitive Deluxe Fish Recorder always delivers professional results and fishing pleasure

Only **$139.95**

- **Increase your fishing enjoyment and success with this quality Heathkit marine instrument**
- **Two instruments in one – acts as depth sounder in addition to dual-range fish spotter**
- **Sensitivity adjustment and two depth ranges let you set it to detect the size and type of fish you want**
- **Bright neon indicator shows you the exact depth of fish down to 120 feet**

A Deluxe Fish Spotter should be standard tackle for any serious angler. This dependable instrument can help increase the size and weight of your catches by detecting fish swimming between the surface and any preset depth to 60 or 120.'

Two ranges, 0-60 or 0-240 feet, ensure the high accuracy and definition so important in a marine instrument of this type. Fish entering the transducer's ultrasonic range will trigger a bright neon indicator which shows you the exact depth. Relatively small variations in fish location can be observed while your boat is in motion.

Two precision instruments in one portable package: The Deluxe Fish Spotter will stand duty as a dependable depth sounder for navigation through unknown waters, and search underwater areas to help you determine the best fishing spots.

The MI-2901 has sensitivity control, corrosion resistant aluminum case, sunshield dial and watertight ceramic transducer element with suction cup mount. It is powered by two 6-volt lantern batteries (not included).

Kit MI-2901A, Shpg. wt. 9 lbs. **139.95**

Use your Visa or MasterCard Credit Card to purchase your kit!

Heath/Zenith Education Courses are carefully designed to provide maximum efficiency and

Now you can apply famous Heathkit/Zenith learning courses to meet your special training needs. Success-oriented with just the right amount of technical theory and a maximum emphasis on real-world applications, Heathkit/Zenith Self-Study and Classroom Courses incorporate the very latest learning methods and materials that are available. Specify Heathkit/Zenith courses with confidence, because our pledge prevails:

"We won't let you fail."

Self-study courses provide effective training for those who can't be taken off the job for group class training, or who wish to enhance their electronics knowledge and skills. Individualized study courses are a convenient and effective means to update or enhance anyone's skills.

Each self-study course is designed to guide the user through important concepts. And audio-visual aids, available with many courses, help teach difficult concepts. Self-test reviews monitor and help ensure understanding of course material while experiments, using parts included with the course, provide needed experience.

Self-instruction courses include comprehensive final examinations. Several courses can even be applied for college credit (see Course Offerings chart).

Heathkit/Zenith Classroom Courses are the complete answer for all types of industries, government agencies, and forward-thinking schools who want to teach technical subjects with maximum efficiency at a minimum cost.

Courses start at the entry level of electronics with the Basic Electronics Series. After completing these courses the student can move into new state-of-the-art technology, branch into the use of instruments or learn about computers from hardware to programming. All of these multimedia courses employ the latest learning enhancement techniques. Text material is presented in concise, fast-paced units of study, with major topic areas highlighted in modular subsections. "Hands-on" experiments provide positive reinforcement through interactivity. Illustrations are used profusely for fast, thorough mastery by students of all ages and different levels of technical experience.

Courses are organized in three separate publications: text, workbook and instructor's

Choose a single course or a series to fit your educational need

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Microprocessor Technology	Advanced Electronics	Robotics Automation	Industrial & Hobby	Computer Servicing	Computer Programming	Circuit Design	Video Programs
MICRO-PROCESSOR (69) + [4]	OPERATIONAL AMPLIFIERS (77) [3]	ROBOTICS & INDUSTRIAL ELECTRONICS (63) [6]	SOLDERING (76)	COMPUTER FUNDAMENTALS (74) [5]	CP/M OPERATING SYSTEM (83)	PASSIVE CIRCUIT DESIGN (78) [8]	DIGITAL TECHNIQUES (67)
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VOICE SYNTHESIS (71) [4]	IC TIMERS (77) [3]	★INTELLIGENT MACHINES (2) [9]	CONCEPTS OF ELECTRONICS (65)	COMPUTER MAINTENANCE (75) [5]	ASSEMBLY LANGUAGE (83)	ANALOG CIRCUIT DESIGN (79) [8]	SOLDERING (76)
MICRO-PROCESSOR APPLICATIONS (71) [4]	PHASE-LOCKED LOOPS (77) [3]	★ELECTRONICS FOR AUTOMATION (2) [9]	HAM RADIO NOVICE (40)		MICROSOFT BASIC (83)	★DIGITAL CIRCUIT DESIGN (78) [8]	
16-BIT MICRO-PROCESSORS (73) [5]	OPTO-ELECTRONICS (77) [3]		HAM RADIO GENERAL (41)		MACRO-86 ASSEMBLY LANGUAGE (82)		
6809 MICRO-PROCESSOR (71) [4]	FIBER OPTICS (75) [2]		HAM RADIO ADVANCED (41)		MACRO-86 ALGORITHMS (82)		
	LASER TECHNOLOGY (76) [7]				AUTOCAD TECHNOLOGY (101)		
					★COMPUTER GRAPHICS (81)		

Key to Course Symbols

- [1] Analog Trainer
- [2] Digital Trainer
- [3] Breadboard Trainer
- [4] Microprocessor Trainer
- [5] Learning Computer
- [6] HERO 1 Robot
- [7] Laser Trainer
- [8] Design Trainer
- [9] HERO 2000 Robot
- ★ New Course
- \+ The American Council on Education recommends that member colleges grant credit for this course.
- ○ See this page number for detailed course information.
- – Linking line indicates a suggested sequence for taking the courses.

economy in either self-paced personal study or classroom and industrial training programs

guide. The student text is the core of the learning material, written in a logical learning sequence that first explains concepts and then builds upon them for a thorough understanding of each topic. Texts are supported by a workbook with exams and experiments keyed to the text presentation. The instructor's guide includes suggestions for making the course more effective but is versatile enough to allow the teacher to add his or her own parameters for challenge and guidance—providing each student with a fully rounded learning experience.

Course trainers offer exciting experience with concepts students have just studied in either classroom or self-study situations. Hands-on learning is provided on well-designed quality experimenters. Course trainers utilize the latest technology and include such innovative equipment as a laser, robot, and a learning computer that can be upgraded to a powerful 16-bit machine. Quality components and parts are provided in separate parts packs for each student or group of students. These contain all the electrical and accessory components necessary for implementing experiments contained in the workbooks.

Continuing Education Units, (CEU's) a nationally-used method of recognizing achievement in non-credit adult education, may be earned by passing the optional final examination with a 70% or higher score.

CEU Exams for Classroom Courses:

EB-6104-80, Electronic Circuits, 2 lbs. **100.00**

EB-6401-80, Microprocessors, 2 lbs. **100.00**

If rapid advances in technology are leaving your employees or students behind, they can catch up quickly and comprehensively. Review the extensive list of courses below, and contact us for more information regarding your needs.

Easier learning through Video Training

Video Courses from Heathkit's Video Training Series provide a complete, convenient, effective and economical approach to learning. Through video animation techniques, students actually see how electronic processes work for better understanding and a higher retention factor. Video Courses include: Microprocessors, Digital Techniques and Soldering.

Complete details are available in colorful brochures. See your local Heath/Zenith Computers & Electronics Center.

	Course	Text Shpg. wt. 2 lbs.	Price	Workbook Shpg. wt. 2 lbs.	Price	Instructor's Guide Shpg. wt. 1 lb.	Price	Assembled Trainer Wt. 6 lbs.	Price	Parts Shpg. wt. 1 lb.	Price	Cassettes Shpg. wt. 2 lbs.	Price
Introductory	Concepts of Electronics	EB-6140 (3 lbs.)	24.95	EB-6140-40 (1 lb.)	10.95	EB-6140-50	9.95	ETW-3100B	179.95	EB-6140-30	29.95	NOT USED	
Basic Electronics	DC Electronics	EB-6101A	19.95	EB-6101-41	10.95	EB-6101-51	9.95	ETW-3100B	179.95	EB-6101-31	24.95	EEA-3101A	19.95
	AC Electronics	EB-6102A	19.95	EB-6102-41	10.95	EB-6102-51	9.95	ETW-3100B	179.95	EB-6102-31	19.95	EEA-3102A	19.95
	Semiconductor Devices	EB-6103A (3 lbs.)	19.95	EB-6103-41	10.95	EB-6103-51	9.95	ETW-3100B	179.95	EB-6103-31	19.95	EEA-3103A	19.95
	Electronic Circuits	EB-6104	19.95	EB-6104-40	10.95	EB-6104-50	9.95	ETW-3100B	179.95	EB-6104-30	34.95	EEA-3104A	19.95
	Test Instruments	EB-6105 (4 lbs.)	19.95	EB-6105-40	10.95	EB-6105-50	9.95	ETW-3100B	179.95	EB-6105-30	29.95	EEA-3105A	19.95
	Electronic Communications	EB-6106	19.95	EB-6106-40 (1 lb.)	10.95	EB-6106-50	9.95	ETW-3100B	179.95	EB-6106-30	34.95	EEA-3106A	19.95
	Digital Techniques	EB-6201A (3 lbs.)	24.95	EB-6201-41	11.95	EB-6201-51	9.95	ETW-3200B	179.95	EB-6201-31	34.95	EEA-3201A	19.95
Microprocessor Technology	Microprocessors	EB-6401A (4 lbs.)	24.95	EB-6401-41 (1 lb.)	11.95	EB-6401-51	9.95	ETW-3400A	359.95	EB-6401-31	64.95	NOT USED	
	Microprocessor Interfacing	EB-6402 (5 lbs.)	24.95	EB-6402-40 (1 lb.)	10.95	EB-6402-50	9.95	ETW-3400A	359.95	EB-6402-30	64.95	NOT USED	
	Microprocessor Applications	EB-6405 (3 lbs.)	24.95	EB-6405-40	10.95	EB-6405-50	9.95	ETW-3400A	359.95	EB-6405-30 (2 lbs.)	54.95	NOT USED	
	Advanced 16-bit Microprocessors	EB-8088 (5 lbs.)	24.95	EB-8088-40	11.95	EB-8088-50	9.95	ETW-100 (33 lbs.)	1095.00	EB-8088-30	59.95	NOT USED	
Advanced Electronics	Operational Amplifiers	EB-601	19.95	EXPERIMENTS IN TEXT		EB-601-50	9.95	ETW-3300B	189.95	EB-601-30	24.95	NOT USED	
	Active Filters	EB-602	19.95	EXPERIMENTS IN TEXT		EB-602-50	9.95	ETW-3300B	189.95	EB-602-30	14.95	NOT USED	
	IC Timers	EB-603	19.95	EXPERIMENTS IN TEXT		EB-603-50	9.95	ETW-3300B	189.95	EB-603-30	29.95	NOT USED	
	Phase-Locked Loops	EB-604	19.95	EXPERIMENTS IN TEXT		EB-604-50	9.95	ETW-3300B	189.95	EB-604-30	29.95	NOT USED	
	Optoelectronics	EB-605	17.95	EB-605-40 (1 lb.)	9.95	EB-605-50	9.95	ETW-3300B	189.95	EB-605-30	29.95	NOT USED	
	Laser Technology	EB-610	19.95	EB-610-40 (1 lb.)	10.95	EB-610-50	9.95	EWS-4200 (12 lbs.)	395.00	EB-610-30 (3 lbs.)	39.95	NOT USED	
Robotics and Automation	Intelligent Machines	EB-1900	19.95	EB-1900-40 (1 lb.)	10.95	EB-1900-50	9.95	EWS-19-35 EWS-19-36 (121 lbs.)	4499.95	EB-1900-30 (2 lbs.) (May)	39.95	NOT USED	
	Robotics & Ind. Electronics	EB-1801 (4 lbs.)	29.95	EB-1801-40	14.95	EB-1801-50	9.95	ETS-18-35 ETS-18-36 (80 lbs.)	1299.95	EB-1801-30 (2 lbs.)	44.95	NOT USED	
	Robot Applications	EB-1812	19.95	EB-1812-40 (1 lb.)	10.95	EB-1812-50	9.95			EB-1812-30	49.95	NOT USED	
	Hero 1 Advanced Experiments	EB-1802 (1 lb.)	24.95	NOT USED						NOT USED			
Computer Servicing	Computer Fundamentals	EB-2001 (3 lbs.)	19.95	EB-2001-40	10.95	EB-2001-50	9.95	ETW-100 (33 lbs.)	1095.00	EB-2001-30	39.95	NOT USED	
	Computer Peripherals	EB-2002	19.95	EB-2002-40 (1 lb.)	10.95	EB-2002-50	9.95	ETW-100 (33 lbs.)	1095.00	EB-2002-30	39.95	NOT USED	
	Computer Maintenance	EB-2003	19.95	EB-2003-40 (1 lb.)	10.95	EB-2003-50	9.95	ETW-100 (33 lbs.)	1095.00	EB-2003-30	29.95	NOT USED	
Circuit Design	Passive Circuit Design	EB-6001 (3 lbs.)	17.95	EB-6001-40	10.95	EB-6001-50	9.95	ETW-1000 (13 lbs.)	369.95	EB-6001-30	10.95	NOT USED	
	Transistor Circuit Design	EB-6002 (3 lbs.)	19.95	EB-6002-40	10.95	EB-6002-50	9.95	ETW-1000 (13 lbs.)	369.95	EB-6002-30	19.95	NOT USED	
	Analog Circuit Design	EB-6003 (4 lbs.)	19.95	EB-6003-40	10.95	EB-6003-50	9.95	ETW-1000 (13 lbs.)	369.95	EB-6003-30	19.95	NOT USED	
	Digital Circuit Design	EB-6004 (4 lbs.)	19.95	EB-6004-40	10.95	EB-6004-50	9.95	ETW-1000 (13 lbs.)	369.95	EB-6004-30	44.95	NOT USED	
Computer Programming	BASIC Programming	EB-6100 (4 lbs.)	21.95	EB-6100-40	10.95	EB-6100-50	9.95	NOT USED		NOT USED			
	AutoCAD	EB-609 (6 lbs.)	39.95	NOT USED		EB-609-50	9.95	NOT USED		NOT USED		NOT USED	

Classroom Course Ordering Information

Credit Card Orders Call TOLL-FREE: 800-253-0570. Alaska and Michigan Residents Call: 616-982-3411.

HERO®1 and accompanying courses provide a complete high-tech robotics training system

Bring the concepts of robotics to life with the completely equipped robot trainer, HERO 1, and its companion courses and hands-on experiments. Take command of the ideal teaching robot and control all the basic systems found on modern and increasingly sophisticated factory robots and automated machines. And learn about the major principles relating to robotics and industrial electronics from easy-to-read self-instruction courses. Then complete exciting experiments, using HERO 1, that demonstrate major robotic concepts while providing valuable training and familiarity with circuitry and components.

1 Explore the world of robotics with HERO 1

An ideal teaching tool, HERO 1 acts as your guide through the fascinating world of robotics and industrial electronics. This computer-controlled, electromechanical device allows you to explore and work with fundamental components and electronic circuitry associated with robot technology.

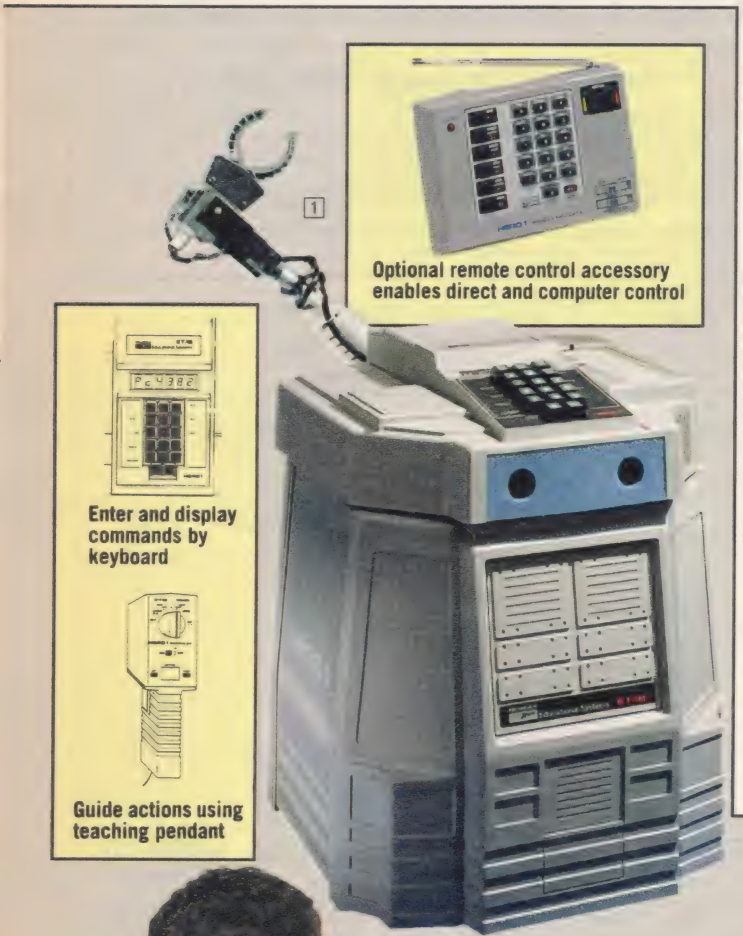
Completely self-contained, HERO 1 is capable of interacting with you and its environment. It detects sound, light, motion, and obstacles in its path; and it can travel over a predetermined course. With its optional arm, the robot can be programmed to pick up small objects with its manipulator. And, its optional voice synthesizer allows the robot to speak in complete sentences.

An intelligent robot, HERO 1 has a computer "brain" consisting of an on-board 8-bit 6808 microprocessor. Following programmed instructions, this microprocessor can guide the robot through complex maneuvers, activate and monitor sensors, and modify the robot's actions as a result of sensor or real-time clock inputs. Memory consists of 8K of ROM, and 4K of RAM which can be increased up to 56K with the addition of an optional memory expansion board. Preprogrammed ROMs that allow HERO 1 to demonstrate its many capabilities are also available for installation on this board.

Command HERO 1 using several different methods. From the top-mounted 17-key hex keyboard you can easily enter, verify, and modify programs as well as select any of the seven separate operating modes. Also access any of the microprocessor's registers through the keyboard. An attachable Teaching Pendant lets you manually control all motor and arm movements, or store them for later duplication. A rear-panel serial port enables programs stored in memory to be transferred to a cassette tape for later reloading and use.

Control HERO 1 using two other methods. One is a remote, radio frequency-controlled transmitter available in two models, each operating at a different frequency. The remote controls all keyboard and Teaching Pendant operations from up to 100 feet away. An RS-232 connector on this accessory permits a computer to remotely operate the robot. A self-contained rechargeable battery supplies the remote with power for up to five hours. The other control method is provided by an optional RS-232 Interface that plugs into the top experimental breadboard of the robot for a direct link to a host computer.

HERO 1 can see and hear through on-board light, sound, and motion detectors plus a sonar ranging system. The sound detector hears over a 300 to 5000 Hz fre-



1

Optional remote control accessory enables direct and computer control

Enter and display commands by keyboard

Guide actions using teaching pendant

2

Robotics and Industrial Electronics Course

3

Robot Applications Course

quency range while the light detector sees over the entire visible spectrum and into the infrared range. The motion detector senses movement up to a distance of 15 feet and the sonar system determines the range between objects and the robot.

Perform experiments on HERO 1's top-mounted breadboard. Conduct course experiments or interface your own circuitry to the robot's CPU. Direct access is available to an I/O port, a user-defined interrupt, CPU control lines, and +12 volt and +5 volt DC power terminals.

Optional Arm with Gripper and Speech Synthesizer gives HERO 1 the ability to grasp and manipulate objects, and to simulate human speech. The arm moves through five axes and can lift 16 ounces when retracted. The phoneme-based synthesizer system generates 64 sounds for speech or sound effects.

Kit ET-18A, Basic HERO 1 Robot (less arm, voice), 66 lbs. **799.95**

Kit ET-18-1, HERO 1's Arm (Arm and Gripper Mechanism), 6 lbs. **349.95**

ETW-18-1, Assembled HERO 1 Arm, Shpg. wt. 5 lbs. **549.95**

Kit ET-18-2, HERO 1's Voice (Phoneme Speech Synthesizer), 1 lb. **99.95**

ETW-18WA, Assembled HERO 1 without arm accessory, 65 lbs. **1699.95**

SAVE OVER $150.00 with ETS-18-35 or ETS-18-36 HERO 1 Robot kit including arm with gripper mechanism and Remote Control Accessory.

Kit ETS-18-35, Kit HERO 1, Arm and Remote Control which operates at 75.43 MHz, Shpg. wt. 78 lbs. ..... **Regularly $1459.80 Now 1299.95**

Kit ETS-18-36, Kit HERO 1, Arm and Remote Control which operates at 75.67 MHz, Shpg. wt. 78 lbs. ..... **Regularly $1459.80 Now 1299.95**

SAVE OVER $500.00 with EWS-18-35 lor EWS-18-36 Assembled HERO 1 Robot including arm with gripper mechanism and Remote Control Accessory.

EWS-18-35, Assembled HERO 1, Arm and Remote Control which operates at 75.43 MHz, Shpg. wt. 95 lbs. ..... **Regularly $2669.80 Now 2149.90**

EWS-18-36, Assembled HERO 1, Arm and Remote Control which operates at 75.67 MHz, Shpg. wt. 95 lbs. ..... **Regularly $2669.80 Now 2149.90**

Kit ET-18-35, Remote Control Accessory for HERO 1, operates at 75.43 MHz, Shpg. wt. 5 lbs. **249.95**

ETW-18-35, Assembled Remote Control Accessory, 5 lbs. **399.95**

Kit ET-18-36, Remote Control Accessory for HERO 1, operates at 75.67 MHz, Shpg. wt. 5 lbs. **249.95**

ETW-18-36, Assembled Remote Control Accessory, 5 lbs. **399.95**

ET-18-4, Demo ROM, a plug-in ROM containing several routines demonstrating all of HERO 1's motor and sense circuits, and voice, 1 lb. **49.95**

ET-18-5, Monitor ROM listing, Shpg. wt. 1 lb. **39.95**

ET-18-6, Memory Expansion Board, an add-on circuit board to HERO 1's CPU board which allows the addition of up to six extra memory devices for over 40K of memory, Shpg. wt. 2 lbs. **49.95**

ETA-18-6, Memory Expansion RAM, an 8K x 8 random access memory chip that installs onto the ET-18-6 memory board, Shpg. wt. 1 lb. **24.95**

ET-18-7, Automatic Mode ROM, a plug-in ROM that enables HERO 1 to move independently around a room while avoiding obstacles, 1 lb. **29.95**

ET-18-9, HERO 1 BASIC, a plug-in ROM that allows you to program HERO 1 in a simple integer BASIC with modifications that enable you to use the Robot's voice synthesizer and its various motors and sensors. To use HERO 1 BASIC you'll need: an ET/ETW-18 Robot, an ET-18-6 Memory Expansion Accessory, one or more ETA-18-6 Memory Expansion RAM, an ETW-18-10 RS-232 Interface Accessory, a terminal or computer with a terminal emulation program, and serial interface cable such as the HCA-10 or HCA-11 on page 101. Shpg. wt. 1 lb. **49.95**

$AVER! Purchase the ETS-18-9 Expansion System and get everything you need to expand HERO 1 for use with HERO 1 BASIC. The System includes an ET-18-9 HERO 1 BASIC ROM, an ETW-18-10 RS-232 Interface, an ET-18-6 Memory Expansion Board, and one ETA-18-6 Memory Expansion RAM.

ETS-18-9, Shpg. wt. 6 lbs. **179.80**

ETW-18-10, RS-232 Interface, allows serial communications between HERO 1 and a terminal or host computer, requires an ET-18-6 Memory Expansion Board, Shpg. wt. 1 lb. **59.95**

ET-18-11, HERO 1 Demo Cassette contains programs on cassette tape demonstrating HERO 1's sensors and voice along with a variety of arm and body movements, Shpg. wt. 1 lb. **14.95**

Advanced Programming Experiments for HERO 1

Unlock the power of HERO 1's Robot Language Interpreter and learn about the subroutines in the robot's monitor ROM. Sixty-one programming experiments provide a wide range of examples designed to teach general programming principles. Learn how to make HERO 1 really perform with these experiments.

EB-1802, Shpg. wt. 1 lb. **24.95**

2 Robotics and Industrial Electronics Course

$99.95

- **Covers the entire field of robotics in a two-volume set filled with illustrative charts and diagrams**
- **Includes hands-on experiments using HERO 1 to gain experience and mechanical familiarity with robots**

A comprehensive course in robot technology, the Robotics and Industrial Electronics Course is the perfect start for your journey into the world of robotics with an A to Z look at how robots work. This course reviews elementary electronic principles used in the robotics field and introduces new concepts associated with robots and automated machines.

In this self-instruction course, the mechanics of robots as well as computer control are completely covered. You master each principle before proceeding to the next in this challenging course. Begin with an introduction to low, medium, and high-technology robots and progress at your own speed to master their different power systems. Become acquainted with the operation of various AC and DC motors and generators, industrial hydraulic and pneumatic systems, and DC stepper motors.

Computer applications are then linked with mechanical principles for complete robotics system coverage. Microprocessors are introduced and you are shown how to write robot control programs. Sensing systems are covered along with how a robot can be made to talk using voice synthesis. Also covered are the skills needed to make a robot perform useful tasks.

Optional hands-on experiments, using the unique teaching robot HERO 1, are also included with this stimulating course. They provide you with a tremendous opportunity to learn, practice, and apply the basic principles of: industrial electronics, computers, automated equipment, sensors, servos, stepper motors, controllers, and other components of industrial robots.

Pass the optional final examination with a 70% or higher score and earn 8 Continuing Education Units plus receive a handsome Certificate of Achievement.

To better understand the material in this course, you should complete the following subjects or have the knowledge contained in the: EE-3101A DC Electronics (page 65), EE-3102A AC Electronics (page 65), EE-3201A Digital Techniques (page 67), and EE-3401 Basic Microprocessors (page 69) courses.

EE-1800, Shpg. wt. 12 lbs. **99.95**

3 Extend your robotics and industrial electronics knowledge with the Robot Applications Course

$99.95

- **Briefly review robot basics and build upon your knowledge base with new concepts and new insights**
- **Perform many more exciting experiments using HERO 1 including the construction and use of an EPROM burner**

Expand your knowledge of robotics with the Robot Applications Course and learn about the technologies that make advanced industrial robots a reality. See how tasks, payback, reliability, quality, and other factors govern the selection of an industrial robot. Learn about the process of signal conditioning that gets the signal from a sensor to the microprocessor controller. Covered in detail are different types of vision, tactile, and environmental feedback sensor systems. After finishing this course, you'll better understand the capabilities as well as the limitations of today's industrial and domestic robots.

A look into a future manufacturing plant is also presented. In this plant, "computer-aided" production is viewed. Present use of industrial robots are then discussed with a look at possible future robot applications.

Nine experiments add to your training experience. All are performed on the versatile robotics trainer, HERO 1. These experiments provide a hands-on opportunity to become acquainted with the concepts and technology covered in the text. All components needed to complete the experiments (including a programmable ROM) are included. An audio cassette tape containing the experiment programs for the EE-1812 course is also supplied.

After completing the optional final exam and passing with a 70% or higher score, you'll earn 4.0 Continuing Education Units. You'll also receive recognition in the form of a Certificate of Achievement suitable for framing.

EE-1812, Shpg. wt. 6 lbs. **99.95**

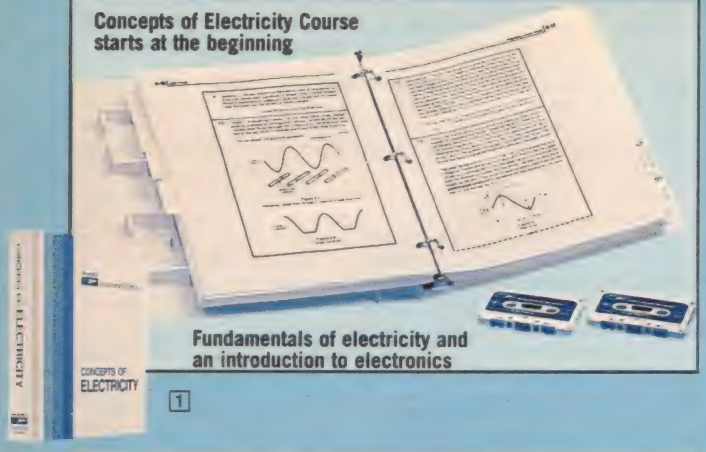
$save $100.00 on a complete robotics training program

This special offer includes the: EE-1800 Robotics and Industrial Electronics Course, EE-1812 Robot Applications Course, EB-1802 Advanced Programming Experiments, ET-18A Basic HERO 1 Robot, ET-18-1 Robot Arm with Gripper, and ET-18-2 Voice Synthesizer.

EES-1800, Shpg. wt. 111 lbs. **1374.70**

Develop a solid foundation for all your studies in electronics with these entry level courses

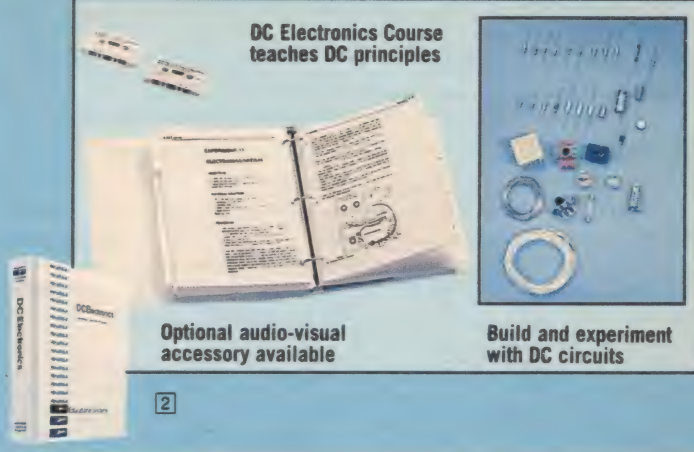
Concepts of Electricity Course starts at the beginning



Fundamentals of electricity and an introduction to electronics

1

DC Electronics Course teaches DC principles

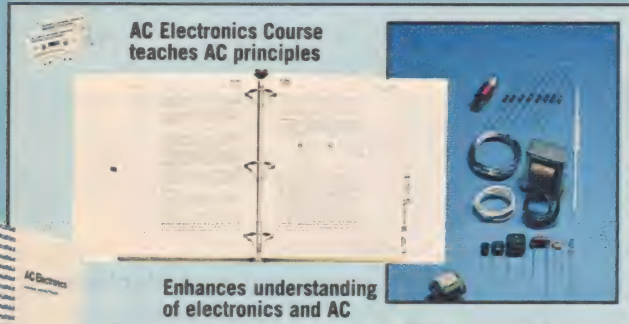


Optional audio-visual accessory available

Build and experiment with DC circuits

2

AC Electronics Course teaches AC principles



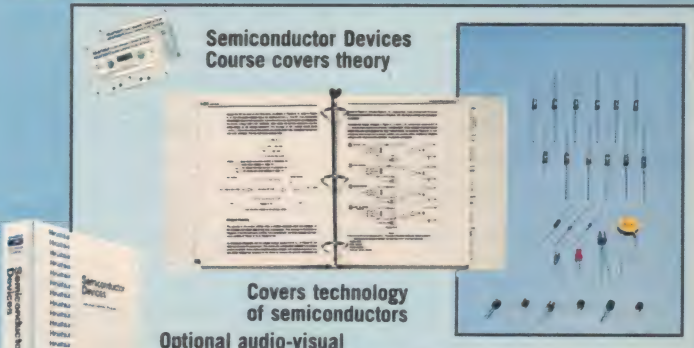
Enhances understanding of electronics and AC

Optional audio-visual accessory available

AC experiments included

3

Semiconductor Devices Course covers theory



Covers technology of semiconductors

Optional audio-visual package available

Includes parts for experiments

4

5 Increase your learning success with hands-on experiments

$109.95

ET-3100B Experimenter and Trainer

Compact, rugged, reliable and versatile, experimental and circuit design tool

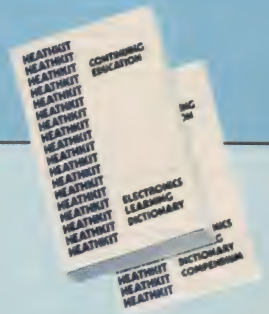
FAST. EASY 2-EVENING KIT

Variable power supplies and 200 Hz to 200 kHz frequency generator

Solderless breadboard sockets for circuit building

Center-tapped transformer supplies 30 V RMS and 60 Hz signal

Built-in 1 kilohm and 100 kilohm variable resistors



Tutorial Electronics Dictionary

This Tutorial Dictionary does more than clearly define electronics technical terms in 832 pages. This Dictionary also contains a summary of 16 electronics-related topics. These outlines allow this informative and well-illustrated Dictionary to become a low-cost self-instructional course in electronics. Each topic outline lists related terms making it an effective learning tool. Approximately 20,000 terms are covered in a clear and concise manner. Make this Learning Dictionary part of your professional library.

EB-1010, 3 lbs. **16.95**

1 Concepts of Electricity Course for the beginner

$29.95

- **Provides a working knowledge in the fundamentals and concepts of both AC and DC electricity**
- **Expands into circuit theory and electromechanical systems**

From the very begining: For those without previous knowledge or experience in the field of electronics, this programmed course is designed to examine the subject at a beginner's level. And, at the same time, act as an introduction to other electronics courses. Begin by learning about the fundamental concepts of both direct and alternating current. Then you expand into the areas of circuit theory and associated electromechanical systems such as motors, generators and meters.

Reviews: Each audio/visual section is followed by a programmed instruction section designed to reinforce what you have just covered. And, a review at the end of each unit tests your understanding of the material.

Course Goals: When you complete this course, you'll be able to explain the difference between AC and DC, and be able to explain the operation of DC and AC generators and motors. After completing the course in your own step-at-a-time pace, you'll know the difference between resistors, capacitors, diodes and other electronic components. Besides being able to solve basic problems involving current, voltage, and resistance, you'll know how to measure them.

Final Examination: Besides being an excellent learning activity, it provides a comprehensive review of the material you've covered. With a passing grade on the Exam, you are awarded an attractive certificate and 1.0 Continuing Education Unit.

EE-3100, Shpg. wt. 5 lbs. **29.95**

MONEY-BACK GUARANTEE

If you are dissatisfied with any self-instruction course for any reason, return all course materials (except trainer) and your receipt for a full refund of purchase price (excluding trainer).

3 AC Electronics Course teaches principles of AC

$59.95

- **Gives a firm foundation in the principles of AC electronics**
- **Shows how various components react in AC circuits**
- **Demonstrates the application and use of AC components**

Advance your knowledge of electronics with a comprehensive coverage of the principles of alternating current, and its special applications in electronic circuits. Presented in the text are AC theory, measurement and circuit behavior. Programmed reviews and experiments reinforce text material.

Perform nine experiments including RC Circuits, RL Circuits, Transformer Characteristics, LC Filters and more. Use the ET-3100B Experimenter/Trainer for experimentation. A multimeter and a scope are recommended for completion of the experiments. Earn 1.5 CEUs and a Certificate of Achievement by passing the final exam with a score of 70% or higher.

EE-3102A, Shpg. wt. 7 lbs. **59.95**

EEA-3102A, Optional Audio-Visual Accessory Package, 2 lbs. **19.95**

5 Versatile ET-3100B Electronic Design Experimenter

The Analog/Digital Circuit Design Trainer is used in all the hands-on experiments in the DC, AC, Semiconductor Devices, Electronic Communications, Electronics for Hobbyists and Test Equipment courses. It is the perfect learning tool for building, analyzing, testing, modifying and gaining experience in practical electronic circuit design. Dimensions: 15¾" W x 10¾" D x 4¾" H:

Kit ET-3100B, Trainer, Shpg. wt. 6 lbs. **109.95**

ETW-3100B, Assembled and tested, 6 lbs. **179.95**

2 DC Electronics Course for essential principles

$49.95

- **Complete background coverage of basic DC electronics**
- **Positive reinforcement provided through experiments**
- **Optional audio-visual package enhances learning process**

DC electronics coverage: An ideal point at which to begin your electronics training, the EE-3101A Course explains the necessary principles required for understanding DC electronics. Subjects covered include: current, voltage, resistance, Ohm's Law, magnetism, electrical measurements, DC circuits, inductance and capacitance. In this course, you'll build and experiment with DC circuits of your own design. And, you'll learn how to draw a schematic from a wiring diagram. The use of a multimeter is also covered.

Self-instructional learning: Heathkit/Zenith's programmed learning allows you to work at your own pace. Review tests are provided so that you can check your progress while reinforcing what you learned. An optional audio/visual package contains two audio tapes and a 123-page illustration booklet with over 230 illustrations to enhance your learning experience. Also included are experiments to help you see concepts as they are put into use. These experiments use the ET-3100B Experimenter/Trainer and a multimeter, like the IM-2260 (p. 46). By taking the final exam and passing with a score of 70% or better, you can earn 2.0 Continuing Education Units and be awarded a handsome certificate.

EE-3101A, Shpg. wt. 6 lbs. **49.95**

EEA-3101A, Optional Audio-Visual Accessory, 2 lbs. **19.95**

4 Semiconductor Devices Course covers solid-state

$59.95

- **Examines semiconductor materials and their electrical properties to form a basic foundation of study**
- **Completely covers diodes, transistors, and integrated circuits and how they are used in circuits.**
- **Optional audio-visual package with cassette tapes and illustration book enhances learning process**

A self-instructed semiconductor education: Step-by-step you learn about the micro-sized world of diodes, transistors and integrated circuits. You examine zeners, bipolar transistors, FETs, thyristors, and UJTs. See how they are made, how they operate and how they are used. Learn how to properly use semiconductor components without exceeding their maximum ratings and without damaging them with improper handling procedures. Learn the electrical characteristics of semiconductor materials. Also see how to correctly test various devices to determine if they are operating as they should.

Each concept is presented in a clearly written text, and instantly reinforced with programmed review. Optional experiments illustrate and enhance your understanding of important concepts with hands-on training.

To perform the experiments in this course you'll need the ET-3100B Trainer. A multimeter is also recommended to make measurements. Pass the optional final exam with a 70% or better score and earn 3.0 Continuing Education Units and receive a Certificate of Achievement.

EE-3103A, Shpg. wt. 6 lbs. **59.95**

EEA-3103A, Optional Audio-Visual Accessory Package, 2 lbs. **19.95**

Fundamental Electronics Series

Begin your electronics education with this comprehensive set of basic courses: DC and AC Electronics and Semiconductor Devices on this page, and Electronics Circuits and Test Equipment on page 67. All use the ET-3100B Trainer in experiments that bring course material to life.

Accredited by the NHSC

Licensed school – State of Michigan

Approved by nationally recognized organizations

Heathkit/Zenith Continuing Education is accredited by the National Home Study Council and licensed as a school by the State of Michigan. These acknowledgements are your assurance that all Heathkit Self-Instruction Programs are quality self-study programs.

Earn College credit for many Heathkit/Zenith courses

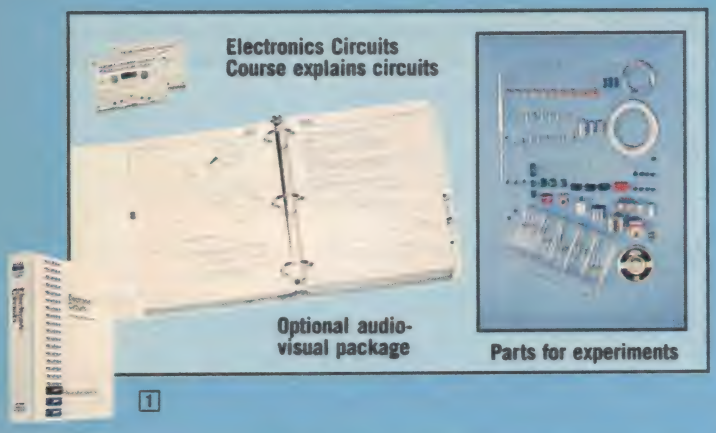
The American Council on Education recommends that member colleges grant credit for several of our courses. Consult "The National Guide" for course recommendations. If you have taken and passed the examinations on pages 65 and 69 (EE-3101A, -3102A, -3103A, -3104A, -3105A, -3201A, -3401) you may be eligible for college credit.

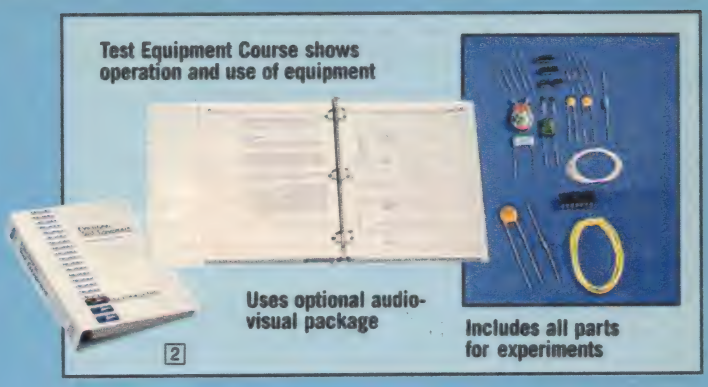
If your college participates in this program, and you have taken the course and passed the final exam, order the Heathkit/Zenith College Credit Program Exam. To order, simply take the course number (for example EE-3101A) and change the prefix to ECC. In our example, you would specify ECC-3101 to order the exam.

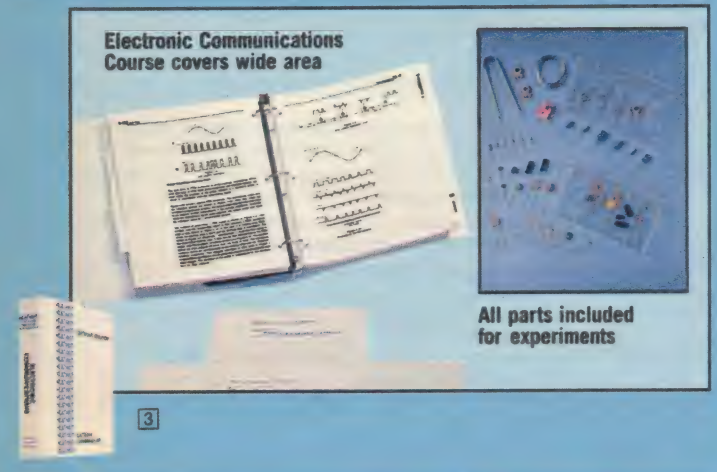
ECC-3101, ECC-3102, ECC-3103, ECC-3104, ECC-3105, ECC-3201, ECC-3401,
1 lb. each ..... **Each 25.00**

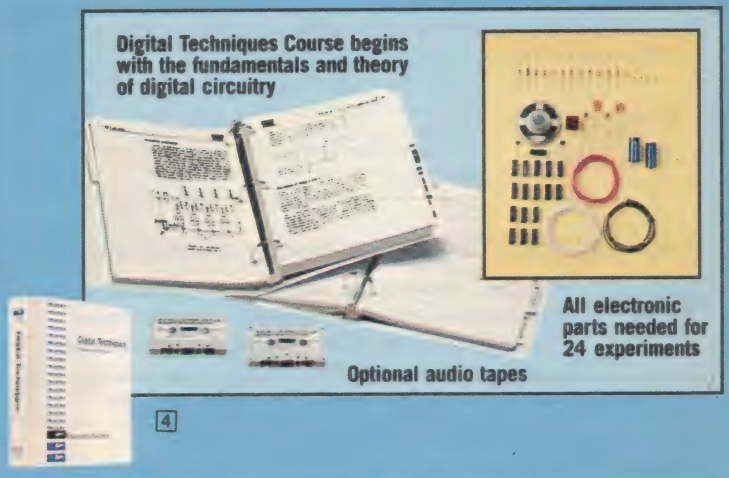
Credit Card Orders Call TOLL-FREE: 800-253-0570. Alaska and Michigan Residents Call: 616-982-3411.

Continue your education in the fundamentals of electronics with these challenging courses




Test Equipment Course shows operation and use of equipment
Uses optional audio-visual package
Includes all parts for experiments
2

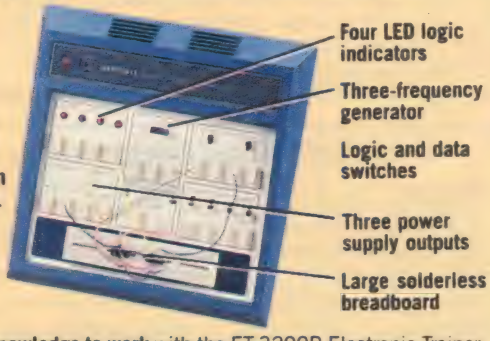



Digital Techniques Course begins with the fundamentals and theory of digital circuitry
All electronic parts needed for 24 experiments
Optional audio tapes
4

ET-3200B Trainer with test lab features

$109.95 Kit

- **Provides many facilities for experimentation**
- **Used for experiments and circuit prototyping**



Put your digital knowledge to work with the ET-3200B Electronic Trainer. Designed for the experiments in both the Digital Techniques and CMOS Digital Techniques Courses, the ET-3200B is a useful tool that helps to speed comprehension by allowing practical application of course material. This versatile Trainer also allows you to build and test prototypes, confirm circuit operation and test digital ICs.

Built-in regulated power supplies furnish ±12 VDC and +5 VDC. Solderless breadboard sockets accept 14- or 16-pin dual in-line ICs; and 24-, 28- or 40-pin DIPs. Has four binary data switches, two no-bounce logic switches, three-frequency pulse clock generator, and more.

Kit ET-3200B, Shpg. wt. 6 lbs. **109.95**
ETW-3200B, Assembled and tested, Shpg. wt. 6 lbs. **179.95**

CMOS Digital Techniques Course

$59.95

- **Stresses practical applications and advantages**
- **Shows interfacing with other logic families**

Learn about CMOS (complementary metal-oxide semiconductor) and why these devices are so desirable in a circuit. This self-instruction course covers the basic concepts of CMOS technology to complex CMOS circuits designed to acquire and process information. Seven units cover such topics as: an introduction to CMOS, interfacing logic blocks, multivibrators, counters and registers, and analog applications.

Learn by doing with practical experiments that illustrate topics from each unit. All components are included with the course for the experiments that are performed on the ET-3200B Trainer. Also recommended for the experiments is the use of an oscilloscope and a multimeter. The EE-3201A Course or equivalent knowledge is a prerequisite. Earn 3.0 CEUs.

EE-3202A, Shpg. wt. 6 lbs. **59.95**

1 Electronics Circuits Course shows how electronic theories work together to make a circuit operate

$69.95

- **Put your knowledge to work and build more skills**
- **Hands-on experiments add to your enjoyment and help to explain technical concepts presented in the course**
- **Optional audio-visual accessory package available**

Go directly from theory to practice with the Heathkit/Zenith Electronics Circuits Course. Seven carefully designed units cover electronic circuits from basic amplifiers through modulation and demodulation. The easy-to-understand text carefully explains a concept before moving on to the next. In this way, you completely master the course without missing any vital information. Many informative illustrations help explain difficult ideas and add to your understanding of the material presented.

The Heathkit/Zenith Electronic Circuits Course exposes you to the circuits you'll find in everyday electronics – and explains them fully.

The proven self-instruction format lets you learn at your own pace: Professionally-prepared text, backed up by easy-to-understand visuals, let you learn more now – and retain more knowledge for years to come.

The Electronic Circuits Course will teach you how to identify power supply rectifiers, filters and regulation circuits – and explain how they work. You'll develop an understanding of amplitude and frequency modulation along with the heterodyne principle and modulation and detection circuits. You will be able to construct transistor and integrated circuit amplifiers, oscillators, active filters and pulse-shaping circuits, power supplies and power supply regulation circuits – even a basic amplitude modulation and demodulation system.

Like all Heathkit/Zenith courses, the Electronic Circuits Course leads you step by step through this challenging subject. Contained within the clear and easy to understand text are sections on basic amplifiers; including the importance of amplifiers, amplifier configurations, biasing and coupling. The next section brings you a discussion of typical amplifiers. Details are provided on audio amplifiers and push-pull, power, video, RF and IF amplifiers. Then on to operational amplifiers, power supplies, oscillators, pulse circuits and various types of modulation.

Included with your Electronics Circuits Course is a well-illustrated and concise text, complete with an attractive and durable vinyl binder. You are also supplied with over 100 electronic components for use in the 18 experiments outlined in the text. The optional Audio-Visual Accessory Package aids your understanding of text material. You should complete DC and AC Electronics and Semiconductor Devices courses (EE-3101A-3103A) or have equivalent knowledge. We suggest a dual-trace oscilloscope, a VOM and the ET-3100B Trainer to complete the experiments in this challenging course.

Pass the optional final exam with a 70% or better score and receive 4 Continuing Education Units (CEUs). You'll also receive a Certificate of Achievement from Heathkit/Zenith Educational Systems that's suitable for framing.

EE-3104A, Shpg. wt. 7 lbs. **69.95**

EEA-3104A, Audio-Visual Accessory Package contains a vinyl holder with two audio cassette tapes and an illustrated booklet. Shpg. wt. 2 lbs. **19.95**

3 Learn Electronic Communications quickly, easily

$64.95

- **Includes a comprehensive 400-page text and all electronic components for conducting experiments**
- **Hands-on learning provided by detailed experiments**

Learn all about the fascinating variety of new technologies involved in electronics communication, in your spare time and at your own pace. With this clearly written Electronics Communications Course, you can develop a full understanding of broadcast and data communications fundamentals.

It covers a wide variety of information: amplitude, frequency, phase and angle modulation; through a study of transmitters and antennas; and an analysis of a communications receiver and specific circuits; to an understanding of state-of-the-art broadcasting and data communications. Seven units in all.

In seven hands-on experiments you'll build an AM transmitter, balanced modulator, AM detector, FM transmitter, receiver, pulse modulator, time division multiplex transmitter and data communications modem. All necessary parts are included. The ET-3100B Trainer (page 64) or equivalent is required.

This specialized course is suggested as a follow-up to the EE-3101A through EE-3104A courses. Successful passage of the final exam earns you 2.0 Continuing Education Units and a personalized Certificate of Achievement.

EE-3106A, Shpg. wt. 7 lbs. **64.95**

EEA-3106A, Audio-Visual Accessory Package, Shpg. wt. 2 lbs. **19.95**

Kit ET-3100B, Trainer, Shpg. wt. 6 lbs. **109.95**

Use your Visa or MasterCard credit card to purchase your kit!

2 Practical Electronic Test Equipment Course covers theory and application of instruments

$69.95

- **Learn to use a wide variety of test equipment including oscilloscopes, meters, counters and other instruments**
- **Includes experiments that allow a look into the operation and practical applications of test equipment**

This Electronics Test Equipment Course offers the knowledge you need to make measurements with digital and analog meters; explain the operation of, and use of the oscilloscope in electronic testing and servicing. From this course you'll also learn to use frequency generators and frequency counters. A unit on special measuring instruments covers bridge circuits, transistor testers, curve tracers, spectrum analyzers and logic probes. The optional Audio-Visual Accessory Package enhances your learning process in these areas.

Fifteen interactive experiments give you the chance to actually use many different types of test equipment. All components for the experiments are included with the course. You should have access to the following equipment to obtain the full benefit from the experiments: a digital multimeter, an analog meter, oscilloscope, frequency generator and frequency counter. Uses the ET-3100B Trainer.

Pass the optional final examination with a 70% or higher score and earn 6.0 Continuing Education Units (CEUs). Also receive a Certificate of Achievement from Heathkit/Zenith Educational Systems. A previous knowledge of material in the EE-3101A thru EE-3104A and EE-3201A is required for the course.

EE-3105A, Shpg. wt. 9 lbs. **69.95**

EEA-3105A, Audio-Visual Accessory package contains an audio cassette tape set, tape holder and manual. Shpg. wt. 2 lbs. **19.95**

4 Comprehensive Digital Techniques Course provides a thorough training in logic circuits

$99.95

- **Learn to design and apply modern digital circuitry**
- **Loaded with practical, hands-on experiments**
- **Learn in your spare time, at your own speed at a fraction of college or technical school costs**

Gain a working knowledge of Digital Techniques the fast Heathkit/Zenith way. Begin with the fundamentals and theory of digital logic including number systems. Become familiar with Boolean algebra, flip-flops and registers, sequential logic circuits, combinational logic circuitry and digital design. Learn at your own pace and when you have the time. After you've completed the course, you'll know how to design digital circuitry for virtually any modern application. All this knowledge at an invitingly low price.

Many explanatory illustrations, audio aids and experiments speed your comprehension of concepts and practical applications presented in the text. Learn using three methods – by reading, listening and doing – a proven method that helps you understand complex subject matter more easily and naturally. Self-test reviews, included with each unit of the Digital Techniques Course, aid retention of important points and help you check yourself before moving on to the next concept. Unit exams further summarize material and test your understanding of the material presented in the course.

Included with the course are all of the electronic components for performing all of 24 experiments. This expertly-organized course is contained in two heavy-duty vinyl binders. They'll keep your text material together and ready for use as a reference long after you've completed the course. A pair of optional audio cassettes are available which contain supplemental verbal text that can be used to help you with your study of digital circuitry.

This course is designed for those with a basic electronics background. Such a background is obtainable by completing Heathkit/Zenith DC, AC, Semiconductors and Electronics Circuits courses on this and the preceding page. The ET-3200B Trainer is required for performing the 24 experiments in the course. To obtain the full benefit from the experiments in this course, a multimeter and a dual-trace oscilloscope are recommended.

Earn 4.0 Continuing Education Units (CEUs) by passing the optional final examination with a 70% or better score. And, receive a personalized Certificate of Achievement from Heathkit/Zenith Educational Systems.

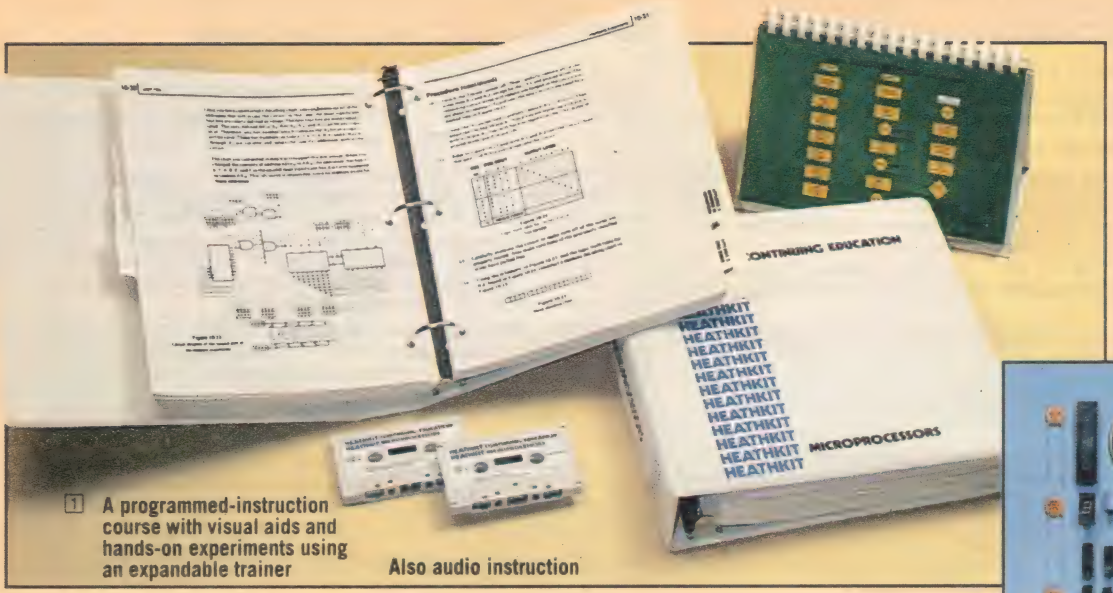
A money back guarantee ensures your satisfaction with this and all the Heathkit/Zenith Self-Instruction Courses. We're that sure we've put together the information you need in a clear and comprehensive format. If it doesn't, simply return all course materials (excluding Trainer) and your receipt.

EE-3201A, Shpg. wt. 7 lbs. **99.95**

EEA-3201A, Optional Learning Cassettes. Two text descriptive audio cassette tapes plus a vinyl holder to keep them in and an illustrated booklet. Shpg. wt. 2 lbs. **19.95**

Heathkit
Zenith
Educational Systems

WINNER
International Award
Society for Technical Communication



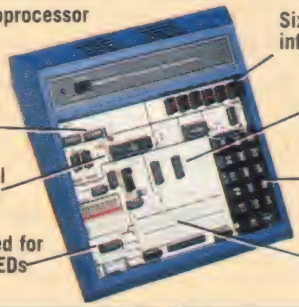
1 A programmed-instruction course with visual aids and hands-on experiments using an expandable trainer

Also audio instruction

Includes all components for experiments

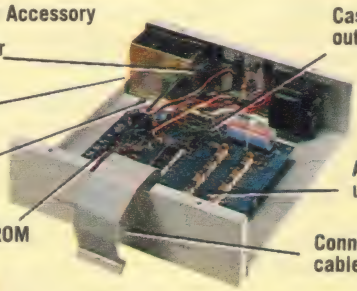
Learn all about microprocessors, microcomputers, interfacing and programming

2 ET-3400A Microprocessor Trainer



- Six 7-segment LED information display
- 512 bytes of random access memory (RAM)
- 1K monitor ROM program
- MC6808 Central Processing Unit
- Hexadecimal keyboard
- Connectors supplied for power, switches, LEDs
- Solderless bread-boarding sockets

3 ETA-3400 Trainer Accessory



- RS-232 connector for terminal
- Cassette input/output port
- Shielded 120 VAC power supply
- Heath/Pittman Tiny BASIC ROM
- Add up to 4K user RAM
- Terminal monitor ROM
- Connector cable

The ETA-3400 Microprocessor Trainer Accessory converts the ET-3400A into a full personal microcomputer system.

Learn all about 8-bit microprocessing with this Microprocessor Course and Trainer

1 Award-winning EE-3401 Microprocessor Course

- **Covers all the basics of microprocessors, microcomputers and machine level programming**
- **Includes hands-on hardware, memory interfacing and programming experiments**
- **Learn about microprocessors faster and more efficiently through programmed instruction with audio and illustrative visual aids**
- **Includes reviews for self-check of progress**
- **Self-instruction course provides an economical and self-paced study-at-home method of training in 8-bit microcomputer technology**

You'll start learning about microprocessors, microcomputers and computer programming as soon as you begin this complete microprocessor self-instruction course from Heathkit/Zenith Educational Systems. Microprocessor basics, computer arithmetic, programming and interfacing...everything you need to know to get a start in the exciting fascinating world of computers is presented in an efficient and well-organized manner.

Preliminary training begins with a review of the basics of computer number systems and codes. Then you apply that knowledge as our prize-winning Microprocessor Course takes you step-by-step through computer arithmetic, programming, examination of popular microprocessors, interfacing and input/output operations that you can put to use immediately.

Concepts are carefully integrated into ten learning units for a thorough training in microprocessors. Starting off is Unit 1 on number systems and codes. It covers decimal, binary, octal and hexadecimal numbering systems. It also includes conversions between number systems, binary codes and positional notation. Unit 2 on microcomputer basics teaches terms and convention, and introduces you to several programming instructions plus how programs are written and executed. In Unit 3 you learn about binary addition, subtraction, multiplication and division, and two's complement arithmetic. You'll also see how to use Boolean logic operators like NOT, AND, OR, Exclusive OR and INVERT.

Progressing at your own speed you are introduced to programming in Unit 4. Here you find out about branching, conditional branching, algorithms and programming instructions. In the next two units, 5 and 6, the 6800/6808 microprocessor is studied. Covered in detail is its architecture, instruction set, addressing modes, stack operations, subroutines, input/output operations and interrupts. Units 7 and 8 continue your education of the 6800/6808 microprocessor with interfacing and its fundamentals. Included is interfacing with random access memory (RAM), displays, switches, and the Peripheral Interface Adapter (PIA).

Programming experiments are the subject of Unit 9. In this unit, you'll write and experiment with a wide variety of increasingly complex programs. At the beginning you'll actually turn the ET-3400A Trainer (used in all the experiments) into a teaching machine that'll give you drills and practice in computer numbering systems. In later experiments, you'll use all instructions and addressing modes including subroutines, stack operations and more.

The final unit of this microprocessor course involves interfacing experiments. Here you put into practice everything you've learned about programming and interfacing. Using the electronic components supplied with this course you convert the ET-3400A Trainer into a digital clock, a musical instrument and a digital voltmeter. You experiment with address decoding, PIAs, input and output of data, parallel-to-serial conversion techniques, digital-to-analog and analog-to-digital conversion techniques, and interrupts.

Units 1 through 6 and Unit 9 assume no prior knowledge of electronics. Units 7, 8 and 10 assume knowledge equivalent to the Heathkit/Zenith EE-3201A Digital Techniques Course described on page 67.

Everything is included with this thorough course. Text is clearly written in the time-proven step-by-step self-instruction format. Colorful visual presentations and reinforcing audio cassette tapes of text material help you to understand concepts more completely. Nineteen hardware experiments provide a hands-on opportunity to apply microprocessor theory in practical applications. All components are included: RAMs, a Peripheral Interface Adapter integrated circuit, a digital to analog converter, op-amps and a variety of other microprocessor-oriented devices. All experiments are performed on the ET-3400A Microprocessor Trainer which was designed for this award-winning course.

Pass the optional final exam with a 70% or better and earn 8.0 Continuing Education Units. In addition, you'll receive a Certificate of Achievement.

EE-3401, Shpg. wt. 12 lbs. **99.95**

2 ET-3400A Microprocessor Trainer doubles as a learning tool and a low-cost 8-bit computer

$259.95 Kit

- **A versatile tool designed to teach and illustrate microprocessor operation, programming and applications**
- **A microprocessor-based software and special interface development system**

Functioning as a miniature digital computer, the ET-3400A Trainer is used with the experiments in the EE-3401 through EE-3405 microprocessor related courses. It features the popular 6808 microprocessor as the central processing unit (CPU) and a built-in 1K ROM monitor program for controlling the unit's operation. Also built-in is 512 bytes of random access memory (RAM).

A 17-key hexadecimal keyboard enables you to access memory locations and to examine their contents on a six-digit hexadecimal 7-segment LED display. Through the keyboard you can step backward or forward to examine or alter other memory locations, examine or change any of the microprocessor's internal registers, set break points for program debugging, or reset the CPU. The flexible instruction set of the 6808 permits use of five addressing modes, two accumulators, an index register and a stack pointer.

A microprocessor breadboard, the ET-3400A features solderless sockets for rapid assembly of IC circuitry. All microprocessor address, control and data busses are buffered and terminated on the front panel for easy connection to experimental memory and interface circuits. There's also a 40-pin external connector for expanding memory and the Trainer's I/O capacity.

Other experimental features include: eight individual and independent buffered LEDs for monitoring logic states, eight SPST binary data switches for logic level switching, built-in +5 and ±12 VDC power supply connections and a clock output. The ET-3400A requires 120 VAC at 50/60 Hz and uses 30 watts.

As a general-purpose training tool and a design aid, the ET-3400A offers flexibility and low cost in a microprocessor breadboard. Team it up with the ETA-3400 Microprocessor Trainer Accessory for increased personal microcomputing power.

Kit ET-3400A, Shpg. wt. 7 lbs. **259.95**

ETW-3400A, Assembled and tested, Shpg. wt. 6 lbs. **359.95**

3 ETA-3400 Microprocessor Trainer Accessory Expands the Power and Capability of the ET-3400A Trainer

$179.95 Kit

- **Turns the ET-3400 Microprocessor Trainer into an 8-bit cassette-based microcomputer system**
- **Expands the capability of the Trainer with an added monitor ROM, expansion RAM and audio cassette storage**

Add this accessory to your ET-3400 or ET-3400A Microprocessor Trainer and turn it into an 8-bit cassette-based microcomputer system. It increases the computing power of the Trainer so that you can run more sophisticated programs. The Accessory's memory expands to 4K bytes of RAM with optional memory.

A serial interface with EIA and 20 mA loop formats enables hook-up to a smart video terminal or a 20 mA ASCII teletypewriter machine. The Accessory also provides a cassette interface which allows you to store programs on convenient standard cassette tapes.

The ROM monitor/debugging program lets you implement the standard trainer monitor functions through the external terminal. Memory locations can be examined or changed, break points initiated and program debugging can be accomplished with a single-instruction step feature. A tiny BASIC Interpreter in ROM lets you program in easy-to-learn BASIC language. User function lets you run machine code routines from BASIC – the same machine code routines you learned in the EE-3401 Microprocessor Course.

The ETA-3400 easily connects to the ET-3400 or ET-3400A Trainer through a 40-pin connector supplied with the Accessory. All the parts required to modify the trainer are included. Since modifying the trainer changes the clock frequency, experiments in the EE-3401 through EE-3405 Courses which use timing loops will be changed. It is recommended that all experiments in these courses be completed before adding the Accessory to your ET-3400 or ETA-3400 Microprocessor Trainer. An H-29 or Z-49 Video Terminal is required to use BASIC and monitor features of the ETA-3400 Microprocessor Accessory.

Kit ETA-3400, Shpg. wt. 8 lbs. **179.95**

EWA-3400, Assembled and tested, Shpg. wt. 8 lbs. **279.95**

ETA-3400-1, Optional 3K Chip Set, Shpg. wt. 1 lb. **54.95**

1

Microprocessor Course includes 6809 module for the ET-3400 or ET-3400A Microprocessor Trainer

All the components you need to conduct the ten experiments are included.

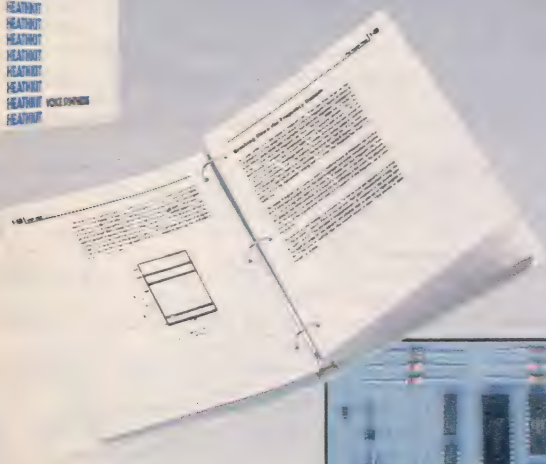
3

Low-cost Microprocessor Interfacing Course is easy to understand

Includes all electronic components necessary to conduct the experiments

2

Voice Synthesis Course teaches digitized and phoneme voice techniques in an easy-to-follow format with experiments



Two popular voice synthesis methods are covered

Includes two complete chip sets and components for experiments

4

Microprocessor Applications Course fills the knowledge void between the real analog world and the microprocessor

Understand how a microprocessor can sense and control events in an analog world

Experiments show how microprocessor control is applied

Expand your digital and microprocessor knowledge with these four courses

1 6809 Microprocessor Course with Trainer adapter

$49.95

- **Learn to program and interface the 6809 microprocessor**
- **Learn to use this microprocessor's flexible instruction set that includes over 1400 different commands**
- **Includes module which converts the ET-3400 or ET-3400A into an advanced 6809 microprocessor trainer**

Progress to programming and interfacing the extremely fast logic processor with the Heathkit/Zenith EE-3404 6809 Microprocessor Course. This seven-unit course completely covers programming and interfacing the advanced 6809 microprocessor. And ten programming experiments provide hands-on experience.

Seven units take you from concepts and 6809 chip structure to interfacing applications. In Unit 1 you begin with fundamental 6809 concepts and how the integrated circuit is structured. This includes the 6809's design philosophy, its evolution and the improving it has undergone. At your own speed, you progress through the 6809's addressing modes in Unit 2; and, go into register and data movement instructions in Unit 3. Unit 4 explains arithmetic, logic and test instructions for the 6809 microprocessor. Unit 5 covers branch and miscellaneous instructions while Unit 6 explains the 6809's input and output signals. The final unit, Unit 7, teaches 6809 interfacing and applications.

Ten hands-on programming experiments are included to enhance your understanding of the 6809 family of microprocessors. These optional programming exercises use the ET-3400 or ET-3400A Microprocessor Trainer (page 69). By performing these experiments you'll reinforce the concepts learned from the text, thereby retaining more and understanding material better.

A special adapter module is included which converts the ET-3400 or ET-3400A Microprocessor Trainer into a 6809-based microprocessor trainer. This assembled module includes a handy debugging routine contained in the 2K byte ROM monitor program. NOTE: This module is not compatible with the ETA-3400's monitor ROM of tiny BASIC.

Four appendices are included with the text. They contain listings for the 6809/6809E Instruction Set and the 6820/6821 Peripheral Interface Adapter (PIA), specification sheets for the MC6809 through MC68B09E microprocessors and peripheral devices, and a summary of the MC6809 Instruction Set.

To prepare yourself for the material contained in the 6809 Microprocessors Course, we recommend that you successfully complete the EE-3401 Microprocessor Course (p. 69) or obtain an equivalent knowledge.

Earn 3.0 Continuing Education Units (CEUs) by passing the optional final exam with a 70% or better score. In addition, receive a Certificate of Achievement in recognition of your effort from Heathkit/Zenith Educational Systems.

EE-3404, Shpg. wt. 6 lbs. **49.95**

2 Voice Synthesis Course details techniques

- **Course covers the hardware and software used in voice synthesis**
- **Includes complete chip sets for digitized and phoneme voice synthesis**
- **Practical Course featuring a great deal of experimentation**

Get on speaking terms with your computer by taking the EE-3403A Voice Synthesis Course. With this course, you can learn state-of-the-art techniques in easy-to-follow format with hands-on experiments that will have your ET-3400 or ET-3400A Microprocessor Trainer (p. 69) talking to you in no time at all.

The two most popular methods of voice synthesis are thoroughly covered, digitized voice synthesis which uses a fixed vocabulary with human voice qualities and phoneme voice synthesis which allows you to reproduce any English word and almost all pronounceable sounds.

The five units of this clearly written course cover the the human voice, with an overview of voice reproduction and voice patterns including: linear and logarithmic coding, delta modulation and variable slope delta modulation, speech synthesis by linear predictive coding, the phoneme speech synthesizer (PSS), and advanced programming for the phoneme speech synthesizer.

By completing the hands-on experiments, you learn about the basic hardware and software necessary for breadboarding (on the ET-3400 or ET-3400A Trainer) computer-synthesized speech. Also learn about the programming and interfacing needed for both digitized and phoneme voice synthesis. In addition, this course prepares you to write machine code programs tailored for the ET-3400 and ET-3400A Microprocessor Trainer. All components are included for experiments.

Complete chip sets for digitized and phoneme voice synthesis are included. The digitized set contains both a ROM chip and a synthesizer chip, featuring a vocabulary totaling more than 200 words. The phoneme synthesizer is self-contained on a single integrated circuit which can produce an unlimited vocabulary.

To better prepare yourself for the material in the Voice Synthesis Course, the EE-3401 Microprocessor Course (p. 69) or equivalent knowledge is needed. Take the optional final examination and earn 3.0 Continuing Education Units and receive a Certificate of Achievement after passing with a 70% or better score.

EE-3403A, Shpg. wt. 4 lbs. **69.95**

3 Detailed Microprocessor Interfacing Course

$99.95

- **Provides in-depth coverage of the 6800 microprocessor family and introduces the powerful 6809 and 68000**
- **Add to your knowledge with detailed interfacing techniques**

Continue your study of microprocessors with this low-cost course from Heathkit/Zenith. The EE-3402 Microprocessor Interfacing Course is a natural starting point after completing the EE-3401 Microprocessor Course. Gain additional knowledge about microprocessors, interfacing techniques and more advanced microprocessors. Programmed self-learning allows you to proceed at your own speed through step-by-step mastery of each important concept.

Eleven in-depth units let you explore topics like: the advanced Peripheral Interfacing Adapter (PIA), analog conversion, serial data communications, peripheral and memory devices, programmable timers, and a thorough discussion of both the 6809 and 68000 advanced microprocessors. Four detailed appendices at the end of the course contain useful listings, data sheets and a summary of the 6800 microprocessor family for you to use as a quick reference guide.

Ten hands-on experiments focus your attention on concepts presented in the text. You'll experiment with display multiplexing, I/O control and handshaking using the PIA, analog-to-digital conversion and ADC interfacing, parallel-to-serial conversion using the 6850 ACIA, serial standard conversion, 2708 EPROM programming, ROM/EPROM interfacing, 6840 PTM input and output, and 6809 software operation. All components required for the experiments are included. Experiments are performed on the ET-3400 or ET-3400A (p. 69) Microprocessor Trainer. All components needed for experiments are included.

Before attempting this comprehensive course, we recommended that you complete the EE-3401 Microprocessor Course (p. 69) or already have an equivalent working knowledge of the material contained in that course.

Pass the optional final examination with a 70% or better score and earn 7.0 Continuing Education Units. Also receive a Certificate of Achievement from Heathkit/Zenith Educational Systems that's suitable for framing.

EE-3402, Shpg. wt. 11 lbs. **99.95**

4 Real-world Microprocessor Applications Course

$99.95

- **Put previous microprocessor knowledge to work**
- **Learn how microprocessors can sense and control events**
- **See practical demonstrations of microprocessor use**

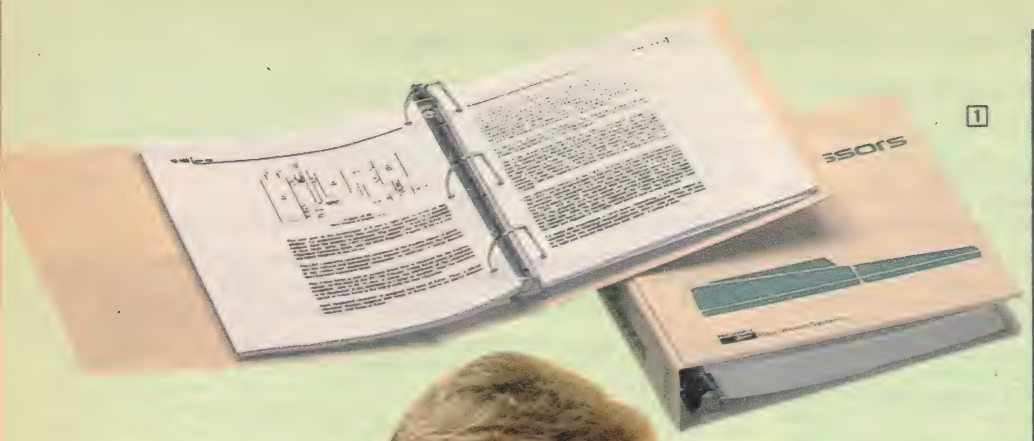
The Microprocessor Applications Course shows you practical ways to adapt and utilize the power of the microprocessor. A complete discussion of analog circuits starts you on your way to an understanding of how a microprocessor can sense and control events in an analog world. This includes digital-to-analog and analog-to-digital conversion techniques along with analog signal conditioning.

A microprocessor must first sense or receive information before it can carry out an assigned task. To acquaint you with this side of a microprocessor, the EE-3405 Course covers in depth sensors and transducers and how they interface to a microprocessor to sense real-world events. Completely covered are temperature, light, position, motion, force, pressure, flow, and level sensors and transducers of various types and styles.

Further units describe microprocessor control of devices and circuits. Covered are control devices and motors including: transistor arrays, SCRs, TRIACs, relays, DC motors and stepper motors. Phase-locked loops, used more and more frequently in microprocessor applications, are presented with interfacing and controlling them with a microprocessor. Numerous examples of microprocessor uses are shown in consumer, industrial and business applications.

The last unit takes a look at present and future microprocessor applications. It was written to stimulate your imagination by examining several actual and possible consumer, industrial and business applications of the microprocessor.

To perform the 13 experiments in this course, you'll need the ET-3400 or the ET-3400A Microprocessor Trainer featured on page 69, plus a VOM and an oscilloscope. You should also complete the EE-3401 Microprocessor Course, also on page 69, and the EE-3402 Microprocessor Interfacing Course on this page or have an equivalent knowledge before attempting this course. Take and pass the optional final exam with a 70% or higher score and earn 8.0 CEUs.

EE-3405, Shpg. wt. 10 lbs. **99.95**

1

advanced
microprocessors

Access to address lines and power supplies
Interfaces to a TV set or video monitor
Access to data, control and PPI lines
Huge solderless breadboard area for experiments
2
Detached keyboard has 6-foot coiled cable
Sixteen special function and control keys
Eighteen numeric and control key keypad
Sixty-one key alphanumeric keyboard

3

Master 16-bit microprocessing with the Advanced Microprocessor Course and the ET-100

1 In-depth Advanced Microprocessor Course

$99.95

- **Covers 16-bit computer technology and the 8088 microprocessor used in the H/Z-100 and other computers**
- **Learn to program and interface powerful and incredibly fast 16-bit microprocessors as used in the H/Z-100**
- **Reinforce your studies with experiments designed to illustrate concepts learned in each unit**
- **Perform all experiments on the ET-100 Trainer, a low-cost 16-bit computer that expands into a disk-based system**

Complete training system: Heathkit/Zenith introduces a truly remarkable, dual learning package. The first half consists of an Advanced Microprocessors Course...EE-8088. A comprehensive training course, it provides an in-depth study of 16-bit microprocessors and covers terms, architecture, and programming. In addition, thorough coverage is given to interfacing the microprocessor to its support devices and to the outside world. The second half is a one-of-a-kind 16-bit training computer, the ET-100 (see below). Available separately, the ET-100 supports the EE-8088 as a working computer-trainer. When the course is completed, the ET-100 can be used as a valuable learning tool, a low cost engineering proto-typing fixture, or a very powerful computer.

Already being used to control many personal and small-business computers, 16-bit microprocessors dominate the marketplace. To help you keep up with this technology, the Advanced Microprocessors Course eases you into the world of 16-bit computing. It begins by acquainting you with microprocessor terms and then introduces assembly language. Progressing at your own speed, you learn about program writing, addressing modes, memory, logic and control lines, dynamic and static RAM, and input/output interfacing. An Appendix ends the course with additional educational information like reviews of number systems and computer math, program code, and hardware and data sheets.

Hands-on learning: To bring your study material to life, the EE-8088 provides more than three hundred pages of experiments. These include experiments in software programming and hardware interfacing. Because it is both a trainer and a computer, both types of experiments can be carried out on the ET-100 Trainer.

Together, the EE-8088 Advanced Microprocessor Course and ET-100 Trainer provides you with the knowledge and experience to master 16-bit microprocessors and computers.

Course materials: An easy-to-read self-instruction program, the EE-8088 consists of 1200 pages of text divided into ten units. Units one through eight cover the subject material and units nine and ten contain experiments to be done following each completed unit. Included with the course are all the parts necessary for performing every end-of-unit experiment.

Course contents: *Unit 1* examines microprocessors and introduces the 8088 microprocessor with instruction addressing modes. *Unit 2* introduces machine and assembly language programming. *Unit 3* shows conditional/unconditional loops and loop addressing plus subroutines. *Unit 4* details the instruction set of the 8088 along with a summary of its addressing modes. *Unit 5* discusses memory segmentation. *Unit 6* explains input/output operations, internal/external interrupts, and string operations. *Unit 7* describes the various MPU bus and control lines, typical address and data bus networks, and data handling techniques. *Unit 8* examines the memory system in detail and goes into the various forms of input/output interfacing. *Units 9 and 10* contain programming and interfacing experiments.

A thorough examination ends each unit and tests your understanding of the material. After completing the course, you can take the optional "Final Examination." Besides testing your knowledge, the final exam provides an excellent review of the material you've covered. After successfully passing the exam with a 70% or better score, you'll receive a Certificate of Achievement and 8 CEUs.

Prerequisites: A better understanding of the material in the EE-8088 Course is achieved with a prior knowledge of digital electronics. This can be obtained through the Heath/Zenith Educational Systems Digital Techniques Course (EE-3201A, page 67) or a similar program. You should also be familiar with binary and hexadecimal numbering systems, and computer math.

EE-8088, Advanced Microprocessor Course, Shpg. wt. 10 lbs. **99.95**
SAVER! Purchase the Advanced Microprocessors Course and the ET-100 Computer/Trainer and save $50.00 over the cost of buying them separately.
EES-8088, Shpg. wt. 49 lbs. **849.90**

2 The world's lowest priced 16-bit computer is our most advanced computer trainer...ET-100

- **Teaches 16-bit microprocessing with EE-8088 Course experiments**
- **Features the H/Z-100's super-fast 16-bit 8088 microprocessor**
- **Has buffered access to all 8088 address, data and control lines**
- **Permits solderless computer circuit building on its large breadboard**
- **Comes with 16 kilobytes of RAM that can be expanded to 64 kilobytes**
- **Has a powerful assembler, screen editor and debugger in 32K of ROM**

Advanced Trainer: For engineers, the ET-100 is ideal for breadboarding computer circuits that interface to the 8088 microprocessor. All control, data, and address lines are readily available around the three solderless breadboards. Even the programmable parallel interface (PPI) is accessible. All access lines are buffered to protect the microprocessor from damage. The ET-100 allows experimenters and technicians to easily and conveniently modify circuits, build interfaces, or simply experiment with the 8088. Four power supply voltages, independently regulated from the logic board supply for protection, are also available on the breadboard to power your projects. For moving your circuit to another location for testing or safekeeping, the top breadboard is removable so you can move the entire circuit without disassembling it. And to those students using the EE-8088 Advanced Microprocessor Course, the ET-100 teaches 16-bit microprocessor fundamentals through course experiments.

16-bit computer: The ET-100 Learning Computer uses the same sophisticated 8088 microprocessor that's found in our H/Z-100 Desktop Computer. A powerful editor, assembler and debugger are permanently stored in ROM for your program writing and editing convenience. The ET-100 has its own cassette port for loading and storing programs and data. And, its RS-232 Input/Output port can be used with a printer or other peripherals. A detached 95-key keyboard includes 16 function keys and a numeric keypad. It generates a full ASCII character set plus 33 graphic characters. The ET-100's video output can be displayed in twenty-four 80-character lines on a monitor, like the HVM-122A monochrome monitor (page 95). Or, display twenty 40-character lines on either channel 3 or 4 of a television using a TV modulator listed at the right.

Kit ET-100, Basic Learning Computer, Shpg. wt. 33 lbs. **799.95**
ETW-100, Assembled and tested, Shpg. wt. 33 lbs. **1095.00**

3 Turn the ET-100 into a disk-based 16-bit computer system and save $200 with the ETA-100A

$799.95
Kit

- **Increases user RAM to 128K**
- **Provides two serial and one parallel port**
- **Includes one 320K 48 TPI disk drive**
- **Provides bit-mapped video graphics**
- **Includes MS-DOS/Z-DOS and Z-BASIC**

Powerful ETA-100A Accessory package: Turns your ET-100 Trainer into a powerful 15-bit disk-based computer that helps you with a variety of applications, such as data processing, telecommunications, and financial analysis. This upgrade package consists of two circuit boards, a boot ROM, and an external disk drive unit. A dust cover is also included so that a monitor such as the HVM-122A monochrome monitor(page 95) can be placed on top of the computer.

H/Z-100 features: After installing the ETA-100A package, your computer will gain many features found in our most powerful desktop computer, the H/Z-100. Features like, 128K bytes of RAM that can be expanded to 192K bytes with the addition of accessory Z-205-1 (page 87). A programmable timer is included that's independent of the system clock. Two full RS-232C serial ports permit communication with printers, modems and voice synthesizers.

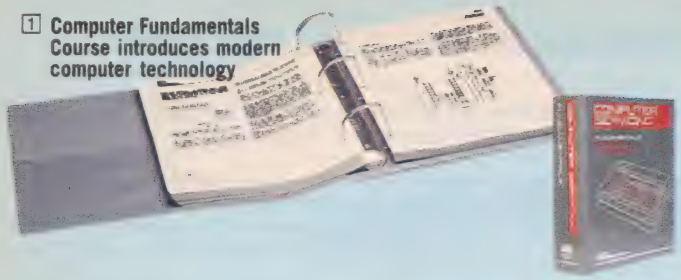
Further features: With the addition of the floppy disk controller and 48 TPI disk drive, the ETA-100A Expansion Accessory can store up to 320K bytes of data. And by adding a second 48 TPI drive with accessory Z-207-3, storage can be doubled to 640K bytes. The ETA-100A uses bit-mapped graphics where individualized pixel-dots are controlled for a 640 x 225 pixel high-resolution graphics display. To have an eight-color display, add two of the Z-219-1 video RAM chips sets found on page 87.

Kit ETA-100A, Expansion Accessory, 69 lbs. ..... **Was $999.95 Now 799.95**
EWA-100A, Assembled Expansion Accessory, Shpg. wt. 70 lbs. **1650.00**
EWS-100-A, Assembled ETS-100, 96 lbs. **2750.00**
ETA-100-1, Extra Removable Breadboard, Shpg. wt. 1 lb. **29.95**
ETA-100-2, Channel 4 Modulator, use with TVs, Shpg. wt. 1 lb. **39.95**
ETA-100-3, Channel 3 Modulator, use with TVs, Shpg. wt. 1 lb. **39.95**

For Computer Credit Card Orders or Information Call TOLL-FREE: 800-253-7057. Alaska and Michigan Residents Call: 616-982-3411.

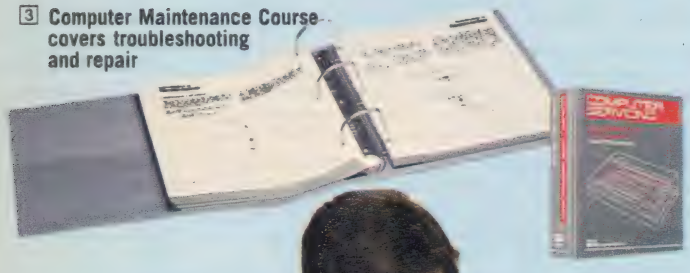
Heathkit/Zenith Educational Systems offers a

The new Computer Fundamentals Series covers the entire microcomputer system including microprocessors, computer architecture, individual sections and the operation of a computer, programming, applications of computers, peripherals, and all about maintaining computers with how to troubleshoot and repair them. The ET-100 Trainer is used in all courses to provide invaluable training experience.



1 Computer Fundamentals Course introduces modern computer technology

2 Computer Peripherals Course examines a variety of peripheral devices



3 Computer Maintenance Course covers troubleshooting and repair

1 Computer Fundamentals Course introduces computers, hardware, software, and their applications

$99.95

- **Get a complete overview of a computer system with a detailed look at the inside of a microcomputer**
- **Learn the meaning of frequently used computer terms**
- **Perform hardware and software experiments on the expandable ET-100 Computer Trainer**

The first in a new series from Heath/Zenith Educational Systems, the Computer Fundamentals Course introduces you to the modern computer. While the concepts discussed in this eight-unit course can apply to computer systems of all sizes, the emphasis is placed on the microcomputer...the machine that has revolutionized the way we do things at the office, at school and at home.

This is a thorough step-by-step introduction to the world of microcomputers that begins with computer basics, applications and systems. You'll learn about power supply sources for computers and the importance of keeping them noise free. You'll become acquainted with 16- and 8-bit microprocessors, bussing and interfacing the central processing unit, different types of semiconductor memories plus bubble and electromagnetic memories, and input and output interfacing. You'll also learn about programming using high- and low-level languages, assemblers, editors, compilers and interpreters. In addition, you'll learn the meaning of many frequently used terms associated with computers, equipment that can be connected to a computer and the software used in computers.

Computer Fundamentals is a self-paced learning program written in easy-to-understand terms. Review exercises and unit examinations help you to track your progress and point out areas where extra study is needed. Pass the optional final examination with a 70% or higher score and earn 2.0 Continuing Education Units, and receive a personalized Certificate of Achievement.

A background in basic electronics and digital theory is needed to better understand the concepts presented. This knowledge is available in EE-3101A DC Electronics, EE-3102A AC Electronics, EE-3103A Semiconductor Devices, EE-3104A Electronic Circuits and EE-3201A Digital Techniques courses.

To perform the hardware and software experiments at the end of each unit you'll need the ET-100 Microcomputer Trainer, a cassette recorder, a video monitor (or television receiver and RF modulator), a single-trace oscilloscope and a multimeter. A dot matrix printer is also helpful.

EC-2001, Shpg. wt. 6 lbs. **99.95**

2 Computer Peripherals Course explains the purpose, capabilities, operation, and interfacing of computers to all types of peripherals

$99.95

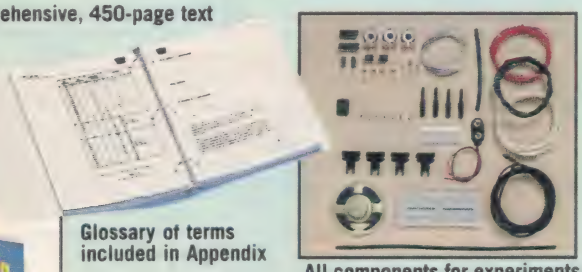
- **Learn about important peripheral devices such as printers, displays, disk drives, modems, and many others**
- **Course covers both the internal and external operation of peripheral devices**
- **Perform experiments on the ETS-100 Trainer, a powerful 16-bit disk-based computer system**

After you have mastered Computer Fundamentals you are ready for the Computer Peripherals Course. The second course in the Computer Servicing Series, the Peripherals Course builds on what you learned in Computer Fundamentals to introduce you to a multitude of peripheral devices.

Explore every aspect of peripheral devices including the purpose, capabilities and fundamental operation of each one and how they are interfaced to a mini or microcomputer. In addition, various input/output (I/O) standards used within and between computers and their peripherals are defined. Control and data flow of electronic and electro-mechanical devices are also discussed.

Seven units, including one on each category of peripheral devices provide a complete and well-organized tour of this important part of computer servicing. You'll start with an explanation of communication standards in serial, EIA and parallel data communications, and will also learn about non-standard interfaces. Next you move on to chapters detailing the ins and outs of input devices, visual displays, printers and plotters, and memory peripherals. Data transmission and peripherals in computer control systems are also thoroughly discussed.

4 Fiber Optics Course explores lightwave technology



Comprehensive, 450-page text

Glossary of terms included in Appendix

All components for experiments included except 9V battery

complete education in microcomputer systems and a thorough training in fiber optics

Interesting experiments provide real experience with the topics you read about. To perform the experiments you will need the ET-100 Microcomputer Trainer and its upgrade accessory (shown on page 73), a cassette recorder and a video display. You will also need a volt-ohm meter, and an oscilloscope. All other components are included with the course.

Proceed through the course at your own pace. All material is presented in easy-to-digest segments that enable you to understand concepts in a step-by-step learning method. Self-test reviews throughout the text let you check your progress, too, for complete understanding. If test results indicate certain information is unclear, you can review before continuing on with the course. Nothing is assumed as all information is complete, clear, and well illustrated.

Pass the optional final examination with a 70% or higher score and earn 2.0 Continuing Education Units, and receive a personalized Certificate of Achievement from Heathkit/Zenith Educational Systems.

To better understand the material and concepts which are presented in the Heathkit/Zenith Computer Peripherals Course you should complete EC-2001 Computer Fundamentals Course on the opposite page.

EC-2002, Shpg. wt. 10 lbs. **99.95**

3 Computer Maintenance Course teaches you how to troubleshoot, repair and maintain computers

$69.95

- **Learn valuable professional troubleshooting techniques for computer repair in addition to servicing basics**
- **Hands-on experiments let you learn to approach computer maintenance using problem solving methods**
- **21 Units provide you with detailed coverage on computer servicing and repair**

Prepare for a career in one of the fastest growing job markets – computer repair and servicing. As computer systems are used in more homes, schools and offices, the need for computer service technicians also grows. You can be part of this wave of opportunity with training in computer servicing and repair. You don't have to be a programmer or system designer to maintain and repair computers. You just need to know the ins and outs of microprocessors, digital troubleshooting and other skills such as those you will learn in this course. The Computer Maintenance Course prepares you for the future with an overall approach to learning how to troubleshoot and maintain computer systems. This course is designed for those with a limited background in microprocessor systems and digital troubleshooting.

The third course in the Computer Servicing Series, Computer Maintenance starts with a review of TTL and MOS devices and then moves on to standard digital troubleshooting techniques. This includes determining the electrical characteristics of integrated circuit input and output pins, using a logic probe and logic pulser probe. You quickly get to apply what you have learned on a digital troubleshooting problem in Unit III.

Next, you are introduced to a typical microprocessor based computer system and you'll learn how each section of the system hardware interacts with the other sections. From here you learn how to troubleshoot each section and how to approach a malfunctioning system. Topics include; how to find the defective block of the system and how to apply classical troubleshooting techniques such as logic state analysis and signature analysis.

You even learn some of the new troubleshooting techniques in this up-to-date course. Explore new techniques such as static stimulus testing and use of a mobile I/O port. Finally, the course discusses system software diagnostics including how to write system diagnostics for a particular system.

Computer Maintenance leads you into the problem solving world of troubleshooting and maintaining computer systems with a simple step-by-step approach. Each unit builds on the preceeding one to achieve optimum comprehension and understanding of each topic. You work at your own pace so that you can take time to master each concept before you go on to the next one. Review exercises and unit examinations help you measure your progress and show you areas in which you need extra work. By passing an optional final examination with a score of 70% or higher you can earn 3.0 Continuing Education Credits and receive a personalized Certificate of Achievement.

Experiments provide you with practical experience in course concepts. To properly conduct these experiments you will need the ETS-100 Microcomputer Trainer, an oscilloscope and a multimeter.

To better understand the material presented in Computer Maintenance you should complete DC Electronics, AC Electronics, Digital Techniques, and Computer Servicing – Fundamentals and Peripherals courses before beginning the Computer Maintenance Course.

EC-2003, Shpg. wt. 9 lbs. **69.95**

Use your Visa or MasterCard credit card to purchase your kit!

4 Learn all about state-of-the-art fiber optics in this exciting Heathkit/Zenith Course

For only $99.95

up-to-date technology

- **Learn how a single fiber optic cable can carry multiple phone calls as well as TV channels**
- **Comprehensive course covers theory, components and the fiber optic system in detailed, illustrated text**
- **Comes with all the components you need and instructions for developing a two-way fiber optic link**
- **Self-instructional course enables self-paced learning with experiments and reviews for reinforcing important concepts**
- **Earn 3.0 Continuing Education Units and a Certificate of Achievement – proof of your new technical knowledge!**

Managers, engineers, students and hobbyists will benefit from this broad, in-depth introduction to the fascinating and challenging science of lightwave technology. Fiber optics is an important, future-shaping breakthrough in rapid signal transmission with cost/performance benefits that are revolutionizing the world of data communications. Even now fiber optics is used as a transmission medium for multiple and simultaneous telephone and television signals. Prepare yourself for the future with this innovative overview of fiber optics from Heathkit/Zenith.

The five-unit Fiber Optics Course covers the fundamentals of fiber optics. Unit 1, Optical Energy, deals with the nature of light. Just as electronics students need a basic understanding of atomic structure and the nature of electrons, so does the student of fiber optics need an understanding of optical radiation. Once this is established, you move on to Unit 2 and optical cables.

Unit 2, Optical Fibers, describes the principles of the transmission medium. You will learn the various fiber types and their construction and how they propagate light. And you will become aware of the importance of such characteristics as numerical aperture, source area and radiation pattern in the energy launch, and loss factors.

Units 3 and 4 of the textbook deal with the active devices used to generate and detect the light used in fiber optic transmission. As you progress through the study of fiber optic light sources, you will learn much about light-emitting diodes. This unit covers their physical construction, theoretical operation, biasing characteristics and several types of fiber optic LED design considerations. A detailed discussion of laser emissions and principles associated with the use of injection laser diodes in fiber optic circuits concludes the fourth unit.

Finally, in Unit 5, Fiber Optic Systems, you will tie all of the component parts together into an operational fiber optic link. You will closely examine the requirements of the various types of links and learn which components best fulfill certain requirements. You'll examine different systems that are is use today and see how they perform as a whole. You'll also see how to design a system with a required bandwidth and with a minimum loss of power.

Four optional hands-on experiments are also included in the course to enhance your understanding of the text. You will construct a modulated source driver circuit, a fiber optic receiver circuit, and fabricate actual fiber optic links. These experiments will allow you to gain valuable design experience, and let you observe the parameters of a fiber optic link directly.

To perform the experiments you will need either a Heathkit/Zenith ET-3400 or ET-3400A Microprocessor Trainer or the ET-3200B Digital Techniques Trainer, an oscilloscope, a multimeter and common hand tools (not included). All other necessary parts are furnished with the course.

In addition to the text, two supplemental appendices support the learning program. A listing of standard resistor values will come in handy when you are building actual circuits from mathematically-derived schematics. Typical data sheets for several fiber optic devices will help in evaluating your newly acquired knowledge. Includes 25-page glossary of terms.

Work at your own pace for optimum learning. Course objectives point out important concepts and provide you with learning goals. Measure your progress with unit tests and use these to decide when to move on to the next unit.

Earn 3.0 Continuing Education Units and a Certificate of Achievement by passing the enclosed optional final exam with a score of 70% or better.

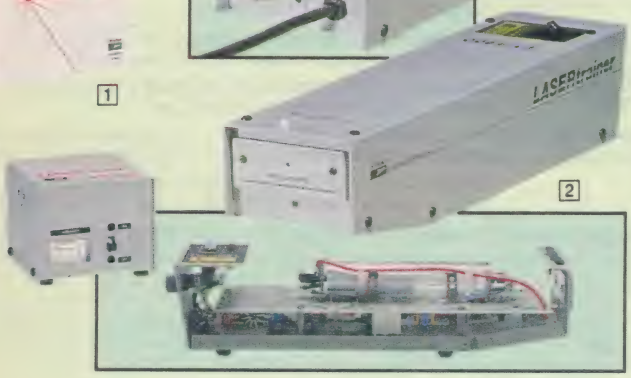
Prerequisites: It is recommended that a student pass the Heathkit/Zenith EE-3101 DC Electronics and EE-3102 AC Electronics courses (or have equivalent knowledge) before taking the Fiber Optics Course. EE-3201A Digital Techniques is also recommended, but not required.

Money-back guarantee: If you are not completely satisfied with the Fiber Optics Course return the course materials to Heathkit/Zenith for a refund of the purchase price (not applicable to trainer).

EE-4201, Shpg. wt. 6 lbs. **99.95**

1

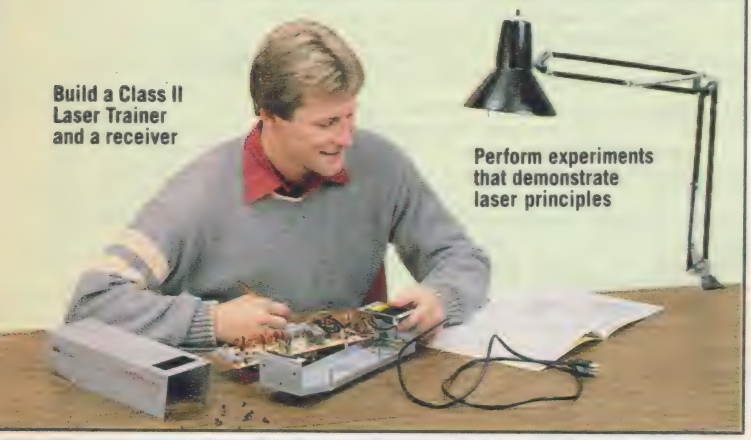
Laser Technology Course and Laser Trainer



2

Build a Class II Laser Trainer and a receiver

Perform experiments that demonstrate laser principles



1 The first "hands-on" training system to teach exciting laser principles and technology

$99.95

- **Learn the terms associated with laser technology and become acquainted with the characteristics of lasers**
- **Learn the basic functions of the laser and its many applications to different areas plus laser safety**
- **Perform fifteen fascinating "hands-on" experiments on an operating laser trainer**

The Laser Technology Course provides you with a clear and thorough instruction in the basics of this powerful technological tool. Far more than a source of illumination, lasers are being applied to many new and exciting fields. In medicine lasers are used for eye, ear, and internal surgery with other applications in special medical treatments. In industry lasers are used for cutting, drilling, and welding. Many other uses have been found in communications, scientific investigation, and precise measurements of distances on earth and in space.

Overall, this course is designed to educate you in laser technology. Covered are optical terms and concepts, characteristics of laser light, laser design and construction, types of lasers, components used in their design, common applications to everyday life, and most of all, safety in using lasers.

Using the Laser Trainer and accompanying receiving unit below, you perform 15 exciting experiments demonstrating laser principles and applications. Transmit your voice over a laser beam and listen to the reproduced speech over the audio speaker in the receiving unit while you watch beam intensity on the power meter.

Pass the optional final exam with a 70% or higher score and receive 3.0 Continuing Education Units while earning recognition with a Certificate of Achievement.

EE-110, Shpg. wt. 7 lbs. **99.95**

2 Trainer enables first-hand look at laser technology

$279.95

- **Commercial-grade low-power Class II laser**
- **Includes Receiver Unit with speaker and power meter**
- **Used in all experiments in the Laser Course**

Build your own laser for a first-hand look at a technology that is expanding as fast as the computer industry did in its infancy. The Heathkit Laser Trainer is used in all the experiments contained in the EE-110 Laser Technology Course and can also be used in your own experiments involving laser optics, communication and holography. The trainer uses a Helium Neon (HeNe) gas laser that generates an intense coherent light in the visible spectrum. It features a tripod mount for steady aiming and signal input jacks for applying up to a 1 volt P-P modulating signal to the laser beam. Included is a crystal microphone that can be used to transmit your own voice. Output power is less than one milliwatt for complete safety. The laser operates on 120 VAC at 60 Hz.

Also included is a laser receiver/monitor. Use it to receive the beam from the Laser Trainer and measure the relative power of the signal on the front panel meter. The receiver also has a built-in detector, audio amplifier and speaker for reproducing sound transmitted over the laser beam. The receiver/monitor operates on two 9-volt transistor batteries (not included).

Kit ETS-4200, Trainer and Receiver, Shpg. wt. 12 lbs. **279.95**

EWS-4200, Assembled and tested Trainer and kit Receiver, 12 lbs. **395.00**

SAVER! Purchase both the Laser Technology Course and the ETS-4200 Laser Trainer with Receiver and save $30.00 over the cost of separate purchases.

EES-110, Shpg. wt. 32 lbs. **349.90**

3

4

3 Advanced Electronic Series courses specialize in five specific areas of electronics

Whether you're an electronics professional, part-time student, or inquisitive hobbyist, the Heathkit/Zenith Advanced Electronics Series provides you with the latest state-of-the-art information on specific subjects. All courses contain parts for included experiments which can be performed on the ET-3300B Trainer. Each course is worth 3.0 Continuing Education Units.

Optoelectronics Course covers latest devices

This course centers on light sources and the different types of optoelectronic displays available, including how to drive and multiplex them. It also provides an in-depth look at light-sensitive components such as: photodiodes, phototransistors, solar cells, optocouplers, lasers and fiber optics. Experiments require the use of a multimeter and an oscilloscope. A previous knowledge of the EE-3101A DC and EE-3201A Digital Techniques courses is needed.

EE-105, Shpg. wt. 5 lbs. **64.95**

Kit ET-3300B, Trainer, Shpg. wt. 6 lbs. **109.95**

ETW-3300B, Assembled Trainer, Shpg. wt. 6 lbs. **189.95**

5

6

7

Active Filters Course shows filter designing

Gain a complete understanding of this critical element of circuit design. Acquire a proficiency in: designing active filters with op-amps; plotting and predicting frequency responses; breadboarding first-order low- and high-pass active filters; second- and higher-order filters; plus bandpass and state-variable filters. The ET-3300B Trainer, an oscilloscope and a function generator are needed to perform the experiments in this course. In the Filters Course you are shown how to use op-amps. For an in-depth discussion of op-amps you can refer to the EE-101 Op-Amps Course on this page.

EE-102, Shpg. wt. 5 lbs. **44.95**
Kit ET-3300B, Trainer, Shpg. wt. 6 lbs. **109.95**
ETW-3300B, Assembled Trainer, Shpg. wt. 6 lbs. **189.95**

Learn the principles of Phase-Locked Loops

See how these state-of-the-art devices work and how they operate. Topics cover: PLL principles, phase detectors, voltage controlled oscillators, loop filters, digital frequency synthesizers, and monolithic PLL ICs and their applications. A DC voltmeter, dual-trace oscilloscope, and an audio generator are needed to perform the experiments included with this course. A previous knowledge obtained in the EE-3101A through EE-3104A Basic Electronics Series and the EE-3201A Digital Techniques Course is desirable.

EE-104, Shpg. wt. 5 lbs. **54.95**
Kit ET-3300B, Trainer, Shpg. wt. 6 lbs. **109.95**
ETW-3300B, Assembled Trainer, Shpg. wt. 6 lbs. **189.95**

Learn about the ideal amplifier in this Op-Amps Course

A comprehensive text details common op-amp parameters, basic op-amp linear circuits, integrator and differential circuits, and the performance of op-amp constant current sources. Also discussed in this course are current/voltage and voltage/current converters, generators, active filters, and bipolar FET op-amps. Accompanying experiments use the ET-3300B Trainer, a multimeter, an oscilloscope, and a function generator. Prerequisites include the Basic Electronics Series, courses EE-3101A through EE-3104A.

EE-101, Shpg. wt. 5 lbs. **49.95**
Kit ET-3300B, Trainer, Shpg. wt. 6 lbs. **109.95**
ETW-3300B, Assembled Trainer, Shpg. wt. 6 lbs. **189.95**

IC Timers Course covers the many uses of timers

See how IC timers work, what they do and where they are used in this Advanced Electronics Series Course. Learn the applications of commmon IC timers to: logic functions, output drive and time delay circuits, wide-range pulse generators, voltage/frequency converters, freewheeling and sine/square wave oscillators, universal timers, speed alarms and precise clock sources. General purpose, precision, monostable and programmable timers are discussed in detail. A multimeter and an oscilloscope are recommended for experiments. Knowledge obtained from the Digital Techniques Course is needed.

EE-103, Shpg. wt. 5 lbs. **49.95**
Kit ET-3300B, Trainer, Shpg. wt. 6 lbs. **109.95**
ETW-3300B, Assembled Trainer, Shpg. wt. 6 lbs. **189.95**

4 Versatile ET-3300B Breadboard Trainer makes doing experiments a lot easier and a lot more fun.

$109.95

- **Redesigned to match our fully updated and comprehensive electronics courses**
- **Features convenient breadboards and multiple power supplies for large, complex circuits**
- **Short circuit protected by fuse and current limiting**

Designed to make your experimental circuit assembly more fun, the ET-3300B Trainer provides several circuit building conveniences that remove most of the common annoyances encountered in circuit building and experimentation. Featured are seven solderless circuit boards, room enough for your larger and more complex circuits. These sockets are designed to accept up to #20 (0.032") solid wire and most common component leads for fast circuit assembly and easy circuit modification. In addition, socket spacing is arranged to accommodate any size dual, in-line integrated circuit package.

Three self-contained power supplies add the convenience of optional voltages to power your breadboard experiments. Save set-up time and eliminate long and tangly power hook-up wires. Output voltages available at power sockets are +5 volts DC (±4%) at 1.5 amps, 0 to +12 volts DC at 100 mA, and 0 to −12 volts DC at 100 mA. All the supplies are short-circuit protected by fuse and fixed current limiting. Two ground connectors are also available.

A multi-purpose trainer, the ET-3300B is specifically designed for use with the specialized experiments contained in all the courses on this page. If you've ever tack-soldered an experimental circuit together just to see what happens, you'll really enjoy the convenience of this plug-in breadboard Trainer. No mess. No parts confusion. No tangled wires. And no connections that come unsoldered. You can concentrate on your circuit and what it's doing when all your connections are solid and stay where you put them.

The ET-3300B Trainer is a light and portable experimental tool that can be assembled in a fast two evenings. It is a UL listed device that requires 120 VAC and 60 Hz power. It has dimensions of 3½" H x 12" W x 12" D.

Kit ET-3300B, Shpg. wt. 6 lbs. **109.95**
ETW-3300B, Assembled Trainer, Shpg. wt. 6 lbs. **189.95**

5 Linear Circuits Course covers basic circuits

- **Cover dozens of basic circuits and their many modifications**
- **Includes components for building more than 30 experimental circuits**
- **Build up each circuit as you study each component's importance**

Learn from concise descriptions of basic circuits and their operation. Progress through a series of circuits where each is used in a schematic and then modified showing how useful parameters are altered. Construct over 30 linear circuits including various amplifiers, astable and monostable multivibrators, pulse position and width modulators, active filters and more.

To observe circuit operation, a voltmeter and an oscilloscope are required. The ET-3300B Trainer provides an orderly working area for your experiments. DC and AC Electronics and Semiconductor Devices course knowledge is needed.

Earn 4.0 Continuing Education Units and receive a Certificate of Achievement by passing the optional final exam with a 70% or better score.

EH-701, Shpg. wt. 2 lbs. **54.95**

6 TTL/CMOS Circuits Course shows advanced digital logic design and use in basic circuits

- **Examines TTL and CMOS circuits in detail while you learn by doing**
- **A series of circuits arranged in a logical sequence for studying**
- **Includes electronic components for assembling over 50 circuits**

Gain a basic knowledge of both digital transistor-transistor logic (TTL) and complimentary metal oxide semiconductor (CMOS) building blocks and how they perform their various functions. Learn about the advantages and disadvantages of each as you perform practical, hands-on experiments in their use.

Learn practical digital logic design and IC applications in this learning and doing course. Put theory to work as you construct decoders, adders, flip-flops, gates, selectors, distributors, comparators and other circuits.

For observing the operation of your experimental circuits, a voltmeter and a dual-trace oscilloscope are needed. All experiments are easily performed on the ET-3300B Trainer. Knowledge obtained in the EE-3101A DC Electronics, the EE-3102A AC Electronics, and the EE-3103A Semiconductor Devices courses are needed to fully understand the material in this course.

Earn 4.0 Continuing Education Units and receive a Certificate of Achievement by passing the optional final exam with a 70% or better score.

EH-702, Shpg. wt. 3 lbs. **59.95**

7 An outstanding Soldering Course for kitbuilders

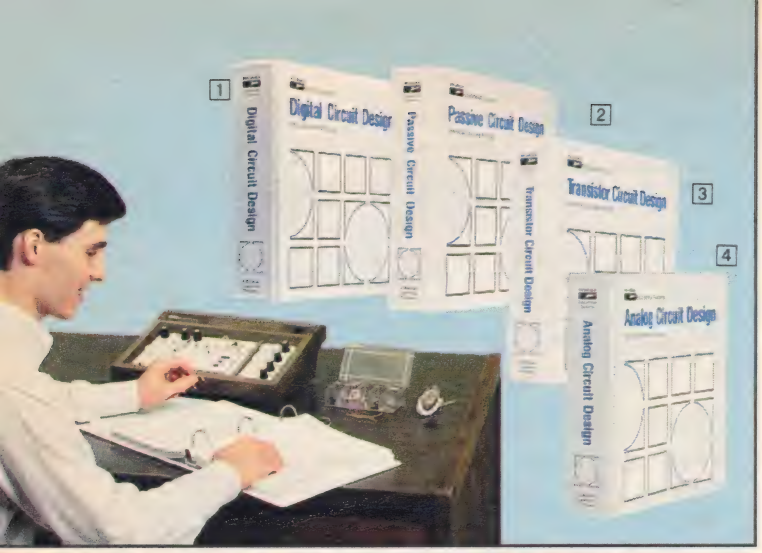
- **Everything you need to know about soldering**
- **Do experiments that finish with a working light blinker**

The EI-3133 Soldering Course is a fun and easy way to perfect your soldering skills whether you're a novice or experienced kitbuilder. The Course teaches professional soldering facts and shows techniques in illustrated detail using the proven Heathkit/Zenith Educational Systems method of hands-on learning.

Topics covered in this course include: the chemistry of soldering, proper soldering iron size, cleaning and tinning the soldering iron, the characteristics of good solder connections, solder bridges, visual troubleshooting for repair, and the best methods of desoldering.

Six soldering experiments are included which require you to use a soldering iron and several small hand tools. Circuit board, components and solder are included. When the course is completed you'll have a two-transistor light oscillator.

EI-3133, Shpg. wt. 3 lbs. **19.95**



Engineering Series teaches circuit design

You can learn to analyze and design practical circuits from these four comprehensive courses: Passive Circuit Design, Transistor Circuit Design, Analog Circuit Design, and the Digital Circuit Design.

1 Digital Circuit Design Course shows how to design digital circuits that have real applications

$99.95

- **Understand how digital circuits operate and obtain maximum learning experience through experiments that demonstrate and apply the material in the text**

This self instruction course on digital circuit design provides a working knowledge of digital electronics which is an essential part of the skills needed by electrical as well as computer engineers and technicians. It involves a very close look at logic circuits which are the basis for decision and memory circuits that are used in all digital computers. When these logic circuits are treated as simple input/output devices, as in this course, little background in electronics is required. You need only be concerned with what goes in and what comes out of the logic device.

An enjoyable and instructive journey into digital circuit design begins with a discussion of digital logic gates that are used as the fundamental building blocks of all digital electronics. Design considerations are presented that relate to various digital IC technology options with an overview of various digital IC devices. After this you start to design working circuits using logic decision circuits.

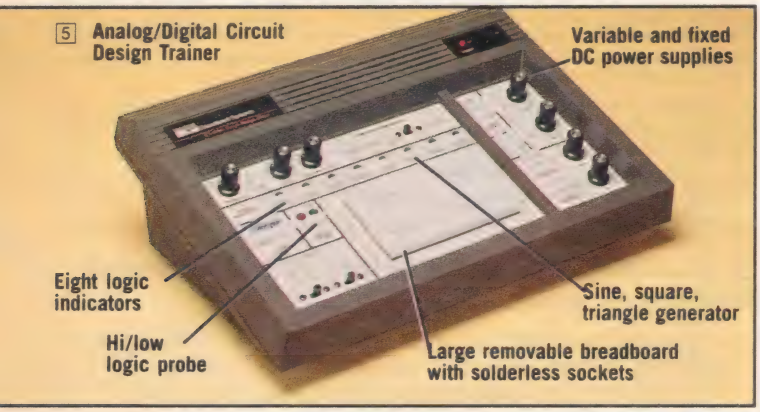
Extending your new found knowledge, you learn how to incorporate memory elements into the operation of a digital circuit. Then you learn how to input data and how to output the results of the logic operation to the outside, real world with interfacing analog-to-digital and digital-to-analog converters. As you finish your instructive journey, you learn about problems arising in designed circuits and their solutions, using test instruments, and general problem-solving guidelines.

No prerequisites courses are required for this area of electronics. Knowledge of the two-state binary system and some basic electronic circuit principles are needed, and is provided for in two appendix selections. Since this course has been written totally independent of any other electronics courses, it can be taken and completed during any stage of an electronics design education.

Use the versatile ET-1000 Analog/Design Trainer to conduct all experiments in the Digital Circuit Design Course and to aid in the development of your own circuits. A single trace scope and multimeter are also required to perform the experiments.

Earn 6.0 Continuing Education Units by passing the optional final examination with a score of 70% or higher. Also receive a personalized Certificate of Achievement, suitable for framing, from Heathkit/Zenith Educational Systems.

EE-1004, Shpg. wt. 10 lbs. **99.95**


5 Analog/Digital Circuit Design Trainer
Variable and fixed DC power supplies
Eight logic indicators
Hi/low logic probe
Sine, square, triangle generator
Large removable breadboard with solderless sockets

2 Passive Circuit Design Course teaches circuit analysis and design using passive components

$54.95

- **First in the Engineering Design Series teaches successful passive-component circuit design**
- **Step-by-step learning begins with how to analyze the needed mathematical skills**
- **Real components and their properties are discussed**

Learn to analyze and design practical circuits using components that do not provide a power gain, such as: resistors, capacitors, inductors, voltage and current sources, transformers and diodes. And, establish a foundation for other design courses in the continuing Engineering Design Series.

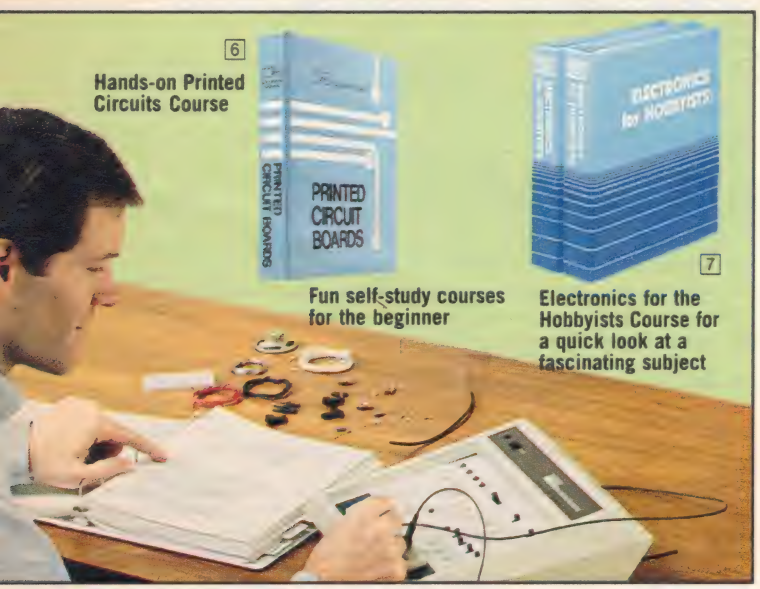
Before you can design circuits you must be able to analyze them. For this reason the first three units of this course provide a thorough review of the analysis techniques and associated mathematical concepts. DC circuit analysis teaches you the math needed for circuit design followed by AC circuit analysis. This is followed by a thorough discussion on the nonideal properties of real components and how to select appropriate devices for given applications.

The remaining four units concentrate on using the techniques discussed in the previous units to design passive circuits. You are shown how to design unregulated power supplies using numerous rectifier circuits and smoothing filters. You learn to design other passive circuits like clippers, clampers, peak detectors, multipliers, and waveshaping circuits. Also illustrated are seven general and nine measurement applications for passive circuits. A final unit contains ten hands-on experiments in using the ET-1000 Trainer, a scope and a VOM.

Earn 4.0 Continuing Education Units and receive a Certificate of Achievement by passing the optional final examination with a 70% or higher score.

Prerequisites for the Passive Circuit Design Course are a basic knowledge of DC and AC electronics, algebra and trigonometry, and a desire to learn.

EE-1001, Shpg. wt. 9 lbs. **54.95**


6
Hands-on Printed Circuits Course
PRINTED CIRCUIT BOARDS
PRINTED CIRCUIT BOARDS
Fun self-study courses for the beginner
ELECTRONICS for HOBBYISTS
7
Electronics for the Hobbyists Course for a quick look at a fascinating subject

8

Variable speed recorder and player increases your learning capability

3 Transistor Circuit Design Course teaches and shows how to design a multitude of useful circuits

$64.95

- **Second in the educational Engineering Design Series**
- **Focuses on the fundamental techniques of successful transistor circuit design using programmed learning**

Continuing with the development of the skills necessary for successful circuit design is the Transistor Circuit Design Course. This clearly written course presents basic techniques for designing circuits using transistors. It begins by describing transistor characteristics and defining their relevant parameters. Using simplified models, you are shown how to develop the appropriate AC and DC equivalent circuits needed in designing transistor circuits. Then you analyze these circuits to determine how various component values affect their operation. At the end of this course you move step-by-step through the actual circuit design process.

Thirteen experiments, all performed on the ET-1000 Trainer, help you to develop the know-how and the confidence to design your own transistor circuits. An oscilloscope and VOM are also required.

To better understand the information in this course, some previous electronics background, like that contained in the Passive Circuit Design Course, is needed.

Earn 4.0 Continuing Education Units and receive a Certificate of Achievement by passing the optional final examination with a 70% or higher score.

EE-1002, Shpg. wt. 9 lbs. **64.95**

4 Analog Circuit Design Course shows basic design techniques using linear-integrated circuits

$69.95

- **Learn how to analyze and design circuits that have a reliability and quality of performance unobtainable in circuits using discrete components**

Third in the Heathkit/Zenith Engineering Design Series, The Analog Design Course shows you how linear-integrated circuits may be used in the design of circuits and instruments that would be impractical with discrete components. At the start of this course, you learn to analyze and design several amplifier and comparator circuits using the versatile operational amplifier. Both op amps and comparators are discussed as specific illustrative examples. They are also used in designing several instruments such as an electronic ohmmeter and a logic probe. Learn to analyze and design linear regulators, oscillators, waveform generators, and other circuits that serve as building blocks in modern electronic systems.

Twelve accompanying experiments performed on the ET-100 Engineering Design Trainer illustrate the designing process and the operation of circuits discussed in the text. You'll also need a dual trace oscilloscope and a VOM.

Earn 4.0 Continuing Educational Units and receive a personalized Certificate of Achievement from Heathkit/Zenith Educational Systems by passing the optional final examination with a 70% or higher score.

To prepare yourself for the material in this engineering design course, we recommend the completion of the EE-1001 Passive and EE-1002 Transistor Circuit Design courses or have an equivalent knowledge of their material.

EE-1003, Shpg. wt. 9 lbs. **69.95**

5 ET-1000 Analog/Digital Circuit Design Trainer

A mini-lab for learning the basic techniques of circuit design this trainer is an excellent tool for performing all the experiments in the Heathkit/Zenith Engineering Design Series. And, its many built-in test instruments and features also provide engineers and technicians with a versatile all-in-one prototyping unit for use in designing and testing analog and digital circuits.

Self-contained test instruments in the ET-1000 Trainer include a function generator that produces sine, square, and triangle waveforms in five switch-selectable ranges from 1 Hz to 100 kHz. These frequencies are also pulse width adjustable in five ranges from 2 ms to 200 ns. To handle your heavy circuit loads, the trainer uses variable and regulated positive and negative 1.2 to 20 volt DC power supplies. In addition, a handy built-in logic probe can be used to detect and indicate HI and LOW logic levels in breadboarded digital circuits.

This solderless double breadboard trainer features two 60 Hz sine wave signal sources of 15 VAC and 30 VAC. Two no-bounce logic switches, a binary switch block, and eight LED logic indicators are all built-in to aid in your digital circuit assembly. Trainer is 15¾" W x 10¾" D x 4¾" H and uses 110 VAC or 220 VAC.

Kit ET-1000, Shpg. wt. 14 lbs. **219.95**
ET-1000-1, Extra Removable Breadboard Accessory, 1 lb. **29.95**
ETW-1000, Assembled and tested Trainer, Shpg. wt. 13 lbs. **369.95**

6 Printed Circuits Course shows how to design, layout, and build printed circuit boards

$69.95

- **Learn direct pattern and photographic etching techniques**
- **Copy printed circuit board layouts from electronics books and magazines or fabricate your own from schematics**
- **Includes all materials to etch your own circuit boards**
- **Make boards for and construct a photoelectric lamp switch and a touch switch for appliances**

Learn to make your own printed circuit boards in this fascinating course. Make them from scratch using either the direct pattern or the photographic transfer technique. Also learn about circuit board materials, layout, preparing artwork, image transfer and assembly.

Learn about the properties of different types of printed circuit board materials and the processes used in manufacturing them. In accompanying experiments learn how to design a circuit, prepare the artwork, and transfer clean art images to the circuit board. Also, learn how printed circuit boards are assembled using automated insertion machines and wave soldering techniques.

In accompanying experiments you'll actually design, layout and etch circuit boards for two home electronic kits, the GD-600 Photoelectric Lamp Switch and the GD-1287 Touch Switch. All necessary materials, components, and hardware to complete the kits and experiments are included. An etch-resist pen, rub-on transfers, art tape, etchant, solvent,and plastic bags are provided to make printed circuit boards by the direct pattern method. A positive pattern, clear acetate, photographic developer and sensitized printed circuit boards are also provided for making boards using the photographic method.

Pass the optional final exam with a 70% or better score and earn 2.0 Continuing Education Units and receive a Certificate of Achievement. Course is available only within the continental United States.

EI-3134, Shpg. wt. 7 lbs. **69.95**

7 Electronics for Hobbyists Course presents a basic knowledge that is applicable in many fields

$69.95

- **Gain an overview of electronics that can apply to hobbies and many other areas of interest**
- **Be able to understand do-it-yourself electronics magazine projects and other basic electronics articles**
- **Optional 26 experiments that offer an insight into the world of electronics and its broad range of applications**

Understand those articles about interesting projects in popular electronics magazines. You can, after you complete the easy-to-understand Electronics for Hobbyists Course from Heathkit/Zenith Educational Systems.

In seven well written and illustrated units, you are taken step-by-step through an excellent course on an introduction to the various aspects of the electronics world. You'll learn about voltage, current, resistance, power, the fundamental mathematics of electronics, and magnetism. Direct and alternating current are introduced along with the operation of transformers, diodes, transistors and ICs.

The use of the voltmeter, ammeter, and ohmmeter for measurement purposes is discussed. Different analog and digital circuit operations are presented, as is the complex world of computers including programming and software. The last unit surveys electronic hobbies: experimentation, radio controlled models, computers, audio and amateur radio.

Previous electronics knowledge isn't required with this beginners course. It is arranged in a logical order and all concepts and terms are explained in a manner that makes learning fun and easy.

To perform the experiments included with the course you'll need the use of the ET-3100B Trainer on page 64. A multimeter and oscilloscope are also needed.

Complete the optional final exam with a 70% or better score and earn 4.0 Continuing Education Units and receive a Certificate of Achievement.

EE-3140, Shpg. wt. 11 lbs. **69.95**

8 Learn faster with this Variable Speed Player

Get a full range of pitch-corrected speeds, from normal to 2 times faster, to cut your listening time in half and still be able to understand every word that you hear. This speed-listening tape recorder features slow-down to 90% of normal speech, built-in electret microphone, tape counter, earphone/external speaker jack, and remote jack. Compact and lightweight with battery, DC, and AC operation.

ECP-3804, Assembled, Shpg. wt. 3 lbs. **139.95**

AutoCAD
SOFTWARE TUTORIAL
AutoCAD
SOFTWARE TUTORIAL
Quickly learn to use sophisticated computer-aided drafting and design software with this systematic AutoCAD tutorial

A Microcomputer-Aided Drafting and Design Program

- **Use the power of large-scale computer-aided design software to produce low-cost, precision graphics on your personal computer**
- **Create high quality drawings and schematics at a fraction of the cost of large-scale systems; never use a drafting table or T-square again**
- **Available with optional 3D for handling parts not just drawings**

AutoCAD* brings the benefits of a high-performance drafting software program within the range of most budgets. It is a general-purpose system suitable for a wide variety of applications including: architectural drawings; drafting for mechanical, electrical, structural and civil engineering; printed circuit design; plus flow charts and organization charts.

AutoCAD is easy to use and to learn, and it requires no computer knowledge. Interactively create and edit drawings of any size and to any scale using basic entities such as lines of any width, circles, arcs, and solid filled areas. Also use previously created drawings or parts of drawings. A well-designed menu structure enables the unskilled user to quickly realize professional results and the veteran user to speed through the program.

Like a word processor manipulating text, AutoCAD easily handles drawings. Move, copy, rotate, and scale drawings to your specifications. And just as quickly and easily make modifications or complete revisions. Work on a drawing at any level of detail using a full bi-directional zoom with a ratio of over a trillion to one. Selectively view or plot drawings as if on transparent overlays using an unlimited number of layers with a layer being assigned any one of eight colors. AutoCAD also uses a number of drawing aids like ruler lines, status reports, and an alignment grid to reduce drafting and design time while increasing and improving your drawing productivity.

Easy to adapt to specialized requirements, AutoCAD features user-defined menus, component and shape libraries, and multiple text fonts and styles. This drafting package also includes powerful facilities for manipulating drawing data and exchanging it with other programs.

More features are added through Advanced Drafting Extensions packages. ADE-1 adds: angular dimensioning; arc/circle diameter and radius; dimension lines at any angle; angles in degrees, minutes, and seconds; length and display of rubber band in status line; and hatch parameters are remembered and can be repeated. ADE-2 includes: dragging, snapping to reference points, named views, making slides for shows, and transferring of attributes to a data base program.

A new ADE-3 optional package is now available. It includes three-dimensional visualization of models that can be edited and plotted as easily as two-dimensional objects. Plus other features like polylines, curve fitting, "freeze" and "thaw" options while layering, and highlighting. CAD cameras are supported and user-supplied or operating system programs can be accessed while running AutoCAD.

AutoCAD is available in two versions, one for the H/Z-100 Computer and the other for use in all the Heath/Zenith Personal Computers and Portable PCs as well as the IBM-PC and IBM-compatible computers. Both versions require a computer to be equipped with a minimum of 328K RAM, two 5.25" disk drives, and be using the MS-DOS Vers. 3 operating system or other compatible operating system.

EC-1307, AutoCAD with ADE-1 and ADE-2 advanced drafting extensions for use with the H/Z-100 Computer, Shpg. wt. 7 lbs. **2000.00**

EC-1307PC, AutoCAD with ADE-1 and ADE-2 advanced drafting extensions for use with Heath/Zenith Personal and Portable Computers along with the IBM-PC and all its compatibles, Shpg. wt. 7 lbs. **2000.00**

EC-1308, AutoCAD with ADE-1 + 2 plus optional ADE-3 enhancements that include 3D for use with the H/Z-100 Computer, Shpg. wt. 7 lbs. **2500.00**

EC-1308PC, AutoCAD with ADE-1 + 2 plus the optional ADE-3 enhancements that include 3D for use with Heath/Zenith Personal and Portable Computers along with the IBM-PC and its compatibles, Shpg. wt. 7 lbs. **2500.00**

*AutoCAD is a trademark of Autodesk, Inc.

Master computer-aided design and drafting

- **Learn to use the important features of a full-sized industrial CAD system with an easy-to-learn and easy-to-use drafting package**
- **An ideal learning tool for high performance drafting training**
- **Includes experiments for hands-on use of drafting software**

Enter the world of computer graphics and see how to put CAD capability at your fingertips with this tutorial package using AutoCAD drafting and design software. Begin with a general introduction to computer graphics, find out about the equipment that makes up a work station, and then delve into the production of drawings using an incredibly powerful drafting software tool.

Divided into eight major subject areas the AutoCAD Tutorial course introduces and guides you in the use of this computer-aided drafting system. It begins with an introduction to computer graphics and helps you get ready to run the drafting software. Next, all the commands necessary to produce drawings accurately and quickly are covered including the use of: points, lines, arcs, circles, text, panning, zooming, layering, blocks, and arrays. Plotters and digitizers are discussed to familiarize you with the wide range of input/output devices that are available. One unit is dedicated to the advanced features of AutoCAD for those who desire a broader and deeper exposure to the power of AutoCAD. All areas are sequential in nature and build on previously presented material.

Hands-on experiments finish this detailed tutorial. They reinforce the lessons learned in this course and enable you to use your newly acquired skills. You learn by actually working with real CAD software. Floppy disks included with the tutorial allow you to create and modify drawings using virtually all of the commands used in AutoCAD.

Two versions of this tutorial are available. One is for use with the H/Z-100 Computer while the other can be used with all the Heath/Zenith Personal Computers and Portable PCs, the IBM-PC, and IBM-compatible computers. Whichever computer is used it must be equipped with a minimum 256K of RAM, two 5.25" disk drives, and have color capability. To benefit fully from this tutorial a color monitor should be used to take advantage of AutoCAD's layering function. A digitizer and plotter are needed, and AutoCAD supports many different models. For use with AutoCAD Version 1.4 and below. Uses MS-DOS.

EBS-609, For use with H/Z-100 Computers, Shpg. wt. 3 lbs. **59.95**

EBS-609PC, For use with all the Heath/Zenith Personal and Portable Computers, and the IBM-PC and its compatibles, Shpg. wt. 3 lbs. **59.95**

Learn to use the power and potential of Microstat

- **Tutorial provides a general understanding of almost all of the functions and capabilities of the Microstat program**
- **Learn to use statistical tests and procedures for data manipulation**
- **Simple on-screen instructions show how to use all functions**

ZDS Microstat Tutorial is a series of interconnected programs designed to acquaint you with most of the functions and capabilities of the Microstat program. Since Microstat is such a comprehensive library of statistical programs, it is impossible to include all the information about this system. However, this tutorial does present most subprograms and their most frequently used options. The tutorial can be used as a beginners learning tool for those who are not familiar with Microstat or as a refresher for those who would like to review particular programs in the wide range offered by Microstat.

Screens and prompts displayed by the tutorial coincide with those found in Microstat programs. As a result of working with the tutorial you'll know what to expect when executing any of the 16 statistical programs. Like Microstat, ZDS Microstat Tutorial is designed as an interactive program using menus and prompts. From the main tutorial menu you can select any of the 16 subprograms and functions that make up Microstat. These include Data Management Subsystem, Descriptive Statistics, Frequency Distributions, Hypothesis Tests: Mean, Analysis of Variance, Scatterplot, Correlation Matrix, Regression Analysis, Time Series Analysis, Nonparametric Statistics, Crosstabs/Chi-Square Tests, Factorials/Permutations/Combinations, Probability Distributions, and Hypothesis Tests: Proportions.

A tutorial text, sample screen displays, and prompts follow all subprogram and function selections from the main menu. Simply follow the on-screen instructions and prompts as the tutorial shows you how to use the selected subprogram or functions. Single key entries let you proceed to the next screen of information or return to the previous menu when completed. So that you'll always know where you're at in the tutorial you are automatically returned to the menu from which you made your last selection whenever a phase is completed.

To operate this tutorial, you'll need a Heath/Zenith Personal or Portable Computer, an IBM-PC, or IBM-compatible computer. You must use the MS-DOS Version 3 operating system and the GW-BASIC 2.0 programming language.

CB-5063-22, Shpg. wt. 2 lbs. **80.00**

Learn data base management while using Condor* 3

- **Learn to simplify all the processes of information management**
- **Discover how to use the power and memory of a computer to access and manipulate information you have entered into the computer**

The Condor 3 Tutor is a series of lessons designed to help you become skillful in the use of this data base management system as soon as possible. Divided into ten lessons, you can study only selected features if you wish or complete each lesson if you are a first time user of Condor. Each lesson consists of instruction, practice exercises on-disk, and practice lessons in the accompanying handbook that let you directly interact with the Condor 3 program.

Topics covered on the four education disks include: the basic concepts and terminology of data base systems, and how to define a Condor 3 file; how to enter information in the records of a previously defined data set and how to examine the data you have entered; how to revise and delete records within your data set and how to organize records in a logical order; and how to create data sets from existing ones. Also covered is how to: perform mathematical operations in Condor 3, use relational operators, transfer updated information and records from one data set to another, and how to use some utility commands to maintain your Condor data sets more effectively. You will develop skills that enable you to create a master data set and an entry data set. In the final lessons you'll learn how to use relational commands to change data sets to perform updates on your master data base, plus you'll learn how to print simple reports from a data set.

Simple key entries make this tutorial easier to use. A single key entry steps you through each lesson while other key entries let you bypass the remaining parts of a lesson, bypass instructional parts, or review portions of a lesson.

Requirements for this tutorial include use of any Heath/Zenith Personal or Portable Computer, IBM PC, or IBM-compatible computer equipped with one or two 5.25" disk drives. Exercises in the tutorial require the use of the Condor 3 software package and the use of two disk drives. A printer is optional. You also need the MS-DOS Version 3 operating system and GW-BASIC programming language.

CD-5063-5, Shpg. wt. 1 lb. **99.00**

Learn to create your own High Resolution Graphics

- **A broad overview of a whole new world, computer graphics, from creation to exciting professional careers**
- **Supplies all knowledge, including hands-on basics, needed to create dazzling high resolution computer graphics**

Put computer graphics at your fingertips with this comprehensive High Resolution Graphics Course. Written for the novice, this course guides you through creating computer graphics which are becoming more and more, a part of our daily lives. Graphics are seen everywhere; TV, newspapers, video games, and newspapers. Enter this exciting world using your own home computer.

Starting from the very beginning, this course shows you the layout of a computer video display screen, the area which you'll learn to control. Some of the most common terminology is also introduced. Next you learn how to put a single dot on the computer's display and then a line. Then you progress to drawing with lines and using them to create graphic figures. Once this is mastered you learn to use Microsoft BASIC graphics commands to draw circles, boxes, and arcs. Color graphics is presented for those computers with color capability.

Turning to applications, you learn how to merge text with graphics and how to animate graphic displays. Human factors such as foreground and background colors, image size, and user participation in programs are discussed. A section is included on photographing on-screen graphics using ordinary camera equipment. Using plotters and digitizing tables are also discussed. A final unit shows what careers are open in area. Pass the final exam and earn 6.0 CEUs.

Working materials included with the text is a pad of worksheets with horizontal and vertical pixel locators for sketching displays. A clear acetate overlay is also provided. Place it on top of any design and it will show what is located at every pixel coordinate. Programming experiments and solutions to text experiments are contained on a 5.25" floppy disk packaged with this course.

A working knowledge of the Microsoft BASIC language is recommended for those interested in this course. And completion of the EC-1110 Microsoft BASIC Course on page 83 would be of great benefit. While a knowledge of higher mathematics isn't required, an understanding of simple algebra is very helpful.

Computer equipment required for the experiments contained in this course is a Heath/Zenith Personal or Portable Computer or an Advanced 100 Series Computer which have built-in high resolution capability. An IBM-PC equipped with a color graphics card can also be used with this course. Optional equipment includes an RGB high resolution video monitor, a dot matrix printer, digitizing pad, digital plotter, and a light pen.

EC-3000, Shpg. wt. 6 lbs. **59.95**

*Condor is a registered trademark of Condor Computer Corporation.

Self-instructive courses in operating systems, programming languages and touch typing

MACRO-86 Assembly Language Programming Course

$59.95

- **Learn to program virtually any computer using the Intel 88/86 series of microprocessors and Microsoft DOS**
- **Designed specifically for Heath/Zenith Desktop and Personal Computers and the IBM Personal Computer**

The MACRO-86 Assembly Language Programming Course is part of Heathkit/Zenith Educational Systems' computer programming series. With it, you'll learn the fundamentals of Assembly Language programming using MACRO-86. Setting this course apart from any other on this subject is the "laboratory" method of instruction. Rather than just tell you, we'll describe and then demonstrate all the features of MACRO-86. These demonstrations will use programs supplied with the course and programs that we'll teach you to write.

After completing this course, you'll be able to describe the internal structure of the Intel 8088 microprocessor and trace instruction and data flow. You'll know how to structure COM- and EXE-type programs, develop flow charts, and design program arrays, structures and records. You'll also be able to input and output data, develop interrupt service routines and design macro instructions.

For this programming course, you should have access to a Heath/Zenith Desktop or Personal computer, an upgraded ET-100 Trainer, or an IBM-PC and the appropriate operating system: MS-DOS, Z-DOS* or PC-DOS. In addition, you'll need the MACRO-86 Assembler and its supporting programs. This course does not include MACRO-86 software. For MS-DOS Version 3, the MACRO-86 Assembler program is part of the CB-3163-30 Programmer's Package found on page 93. You should also be familiar with the operating system and have access to system programs (and supporting files).

Pass the final examination with a 70% or higher score and earn 5.0 Continuing Education Units. In addition, you'll also receive a Certificate of Achievement from the nationally recognized and accredited Heath/Zenith Educational Systems.

EC-1201, Shpg. wt. 10 lbs. **59.95**

MACRO-86 Programming Algorithms Course

$59.95

- **Gain familiarity with algorithms as programming tools**
- **Run experiments on a Heath/Zenith or IBM Computer**

The MACRO-86 Programming Algorithms Course is also part of Heathkit/Zenith Educational Systems's computer programming series. It is a seven-unit course that shows you how to solve problems on a computer with a structured plan (or algorithm). The course demonstrates the importance of the algorithm phase in developing a program. And, it uses programs that are provided or programs that you write to demonstrate applications of the material in the text.

In addition to writing algorithms, you'll learn to translate them into MACRO-86/Intel 8088 mnemonics. Control structures, an extended example of translating an algorithm, and conventions are also discussed. When finished, you'll know how to clearly define a problem and then solve it using an algorithm.

Experiments at the end of each unit are written for a computer system using Intel 8088 microprocessor, such as the: H/Z-100 Desktop Computer, the Heath/Zenith Personal or Portable Computer, an upgraded ET-100 Trainer, or the IBM Personal Computer. The MS-DOS operating system and MACRO-86 Assembler (not supplied with the course) are used in all experiments. A 5.25" floppy disk, supplied with the course, contains experiments, programs and demonstrations for use in the Programming Algorithms Course. A programmers pad is also supplied.

Before you begin this course, we recommend that you take the MACRO-86 Assembly Language Programming Course or be familiar with the instruction set for the 8088 microprocessor and its various addressing modes. You should also know the commands to your operating system that manipulate files and Assembly Language programming techniques including loops, tests and subroutines.

Take and pass the optional final examination with a 70% or better score and earn 4.0 CEUs. Plus, you'll receive a handsome Certificate of Achievement.

EC-1202, Shpg. wt. 6 lbs. **59.95**

*Z-DOS is a trademark of Zenith Data Systems Corporation.

Quickly learn touch typing with TYPING TUTOR III

$49.95

- **Unique keyboard-instruction program teaches you to type faster and more efficiently**
- **Includes fascinating arcade-style game that sharpens your speed skills in an exciting break from dull drills**

A computer-aided instruction program, TYPING TUTOR III is a series of typing lessons and tests that continually adjust to your proficiency level. If you're a beginner, start off with just a few keys. This tutor program will add keys as you become more proficient until you're accurately and easily typing the alphabet, special symbols and numbers. TYPING TUTOR III creates lessons and tests specially tailored to your unique requirements that encourage you to respond automatically and without errors. Numeric keypad lessons are also included.

Included is an arcade-style game called LETTER INVADERS that enables you to sharpen your speed skills while having fun at the same time. TYPING TUTOR III is easy to use with one-key on-screen help messages. It requires a Heath/Zenith PC or IBM PC computer with one 5.25" disk drive and MS-DOS.

EZ-1007, Shpg. wt. 1 lb. **49.95**

MS-DOS Course covers fundamentals and organization

$59.95

- **Complete coverage of how to access system routines, do console input/output and work with disk files**
- **Cassette narration guides you through the course while computer exercises give you experience**

In seven units, this comprehensive course teaches how MS-DOS, Z-DOS And PC-DOS are organized and all about how to effectively use them. Directed toward the novice computer user, this self-study course provides instructions on all the built-in commands and on the typical transient utilities.

Fifteen computer exercises, included on a 5.25" floppy disk, provide you with an opportunity to use MS-DOS features and commands on an H/Z-100 Desktop, Heath/Zenith PC, an upgraded ET-100 Trainer, or an IBM Personal Computer. This course requires the MACRO-86 Assembler software. For MS-DOS Version 3, the MACRO-86 Assembler program is part of the CB-3163-30 Programmer's Package found on page 93. Some commands and files that are MS-DOS Version 3 specific are not covered.

Pass the optional final examination with a 70% or better score and earn 3.0 Continuing Education Units. And, receive a Certificate of Achievement.

EC-1121, Shpg. wt. 6 lbs. **59.95**

8080 Assembly Language Course

$54.95

- **Learn to use less memory space and to run faster programs that don't waste time interpreting commands**
- **Workbook includes experiments and a discussion of disk operating system console input/output**

Learn to program in the low-level language your computer understands best, Assembly Language. This language uses labels, operands, comments and assembler directives that enable you to create a source code that's both easily read and adapted to your computer system. Symbolic notation and easy-to-carry-out documentation methods make program listings easy to understand.

The included workbook contains experiments for use on the H/Z-89 Computer.

Pass the optional final examination with a 70% or higher score and receive 3.0 Continuing Education Credits plus a Certificate of Achievement.

EC-1108, Shpg. wt. 7 lbs. **54.95**

Learn to program computers using Microsoft BASIC

$99.95

- **Audio-tutorial method of learning directs, explains and coaches you through writing programs in Microsoft BASIC**
- **Audio tapes and workbook combine to provide you with an experience not unlike having your own private tutor**

Cover every aspect of computer programming using Microsoft BASIC, one of the most versatile programming languages for microcomputers. Learn how to get the most from this programming language and improve your programming skills. Microsoft BASIC can be used on many popular home computers including Heath/Zenith, TRS-80 and APPLE computers. Does not cover GW-BASIC.

This comprehensive course uses an audio-tutorial approach to learning. Three audio tapes and a workbook combine to perform interactive, highly structured lessons that provide an experience very much like working with your own private tutor. Fundamental aspects are discussed first with a heavy concentration on basic skills and methods involved in computer programming. Specialized programming techniques complete this course. Hands on computer exercises alternate with the text to make the presented material more meaningful.

To obtain the full benefit from this course you'll need access to a computer that uses Microsoft BASIC. Pass the optional final examination and receive 5.0 Continuing Education Units plus a Certificate of Achievement.

EC-1110, Shpg. wt. 7 lbs. **99.95**

Get the most out of the CP/M* operating system

$59.95

- **An audio-visual tutorial that covers all the aspects of the CP/M operating system**
- **Audio-visual format, computer exercises and a logical structure make it easier to learn CP/M**

A beginner-oriented course, the EC-1120 CP/M Course makes it possible for even first-time computer users to easily learn about the operating system that has become an industry standard. It begins with the very basics, so elementary that a previous background in CP/M or Assembly Language isn't necessary.

A thorough 500-page text and five audio cassette tapes makes it very easy for you to learn about CP/M. An introduction to this operating system shows how to use basic CP/M commands. This includes the operating system's major control functions and diagnosing problems from error messages. Built-in commands of the command control processor are discussed along with a coverage of transient programs. You'll also learn to use the system's resident text editor to edit files.

This Course is designed for use with computers having 48K bytes of RAM and able to use the CP/M operating system, such as an H/Z-89 or H/Z-100 Computer.

Pass the the optional final exam with a 70% or higher score and earn 2.5 Continuing Education Units, plus receive a personalized Certificate of Achievement.

EC-1120, Shpg. wt. 6 lbs. **59.95**

Programming course teaches powerful FORTRAN

$99.95

- **Learn about the powerful programming language preferred by scientists, mathematicians and engineers**
- **An audio tutorial course containing six cassette tapes concentrating on programming with computer exercises**

A very powerful language, FORTRAN simplifies complicated scientific and mathematical problem solving. Learn its fundamentals and how to use its power with this highly effective audio-tutorial FORTRAN Programming Course.

This 11-unit course begins with a special introduction to computers and then introduces FORTRAN programming. Subjects covered in this course include: program analysis, variables, expressions, input and output, identifying and writing self-contained procedures, making decisions, loops, data types, and more.

Hands-on experiments provided with this course enable you to actually write FORTRAN programs. Coding forms are included. To get the most from the experiments, as well as the course, we recommend that you perform the experiments on a computer such as the H/Z-89, H/Z-100, or the Heath/Zenith Personal or Portable Computer. With these computers you'll need either CP/M or MS-DOS plus the compatible FORTRAN programming language.

Pass the optional final examination with a 70% or higher score and receive 5.0 Continuing Education Units plus a Certificate of Achievement.

EC-1101, Shpg. wt. 7 lbs. **99.95**

Microcomputing Course shows the basics of computers

$49.95

- **See how a computer can help meet your everyday needs at the office or in the home**
- **Written in everyday language so you can understand computers and therefore make an intelligent purchase**

For those who want to know what a computer can do for them, this Microcomputing Course is an ideal place to start. In easy and simple terms, you are shown what a computer can do for you. The self-instruction text fully explains the different parts of a computer and shows you how to apply its capabilities to your specific needs. With the text and two accompanying audio cassette tapes, you'll learn about computer hardware and how it works to better evaluate what extras you'll need along with your computer. And, you'll also learn about software and how to choose the best programs for your use.

Earn 3.0 Continuing Education Units and receive a Certificate of Achievement by passing the optional final exam with a 70% or higher score.

EC-1000, Shpg. wt. 5 lbs. **49.95**

*CP/M is a registered trademark of Digital Research, Inc.

Use your Visa or MasterCard credit card to purchase your kit!

Tough competitors in a PC world that will meet all your expectations at a low kit price

$899.00

HS-148 with FREE HVM-122A Monitor

Two high-performance kit computers, the HS-148 Compact PC and the HS-158 Expandable PC, with complete PC capability and IBM PC compatibility. Two computers with features and flexibility to keep up with your needs now and later, and priced within your budget.

Two computer kits to put power and performance at your fingertips. Two choices, the Compact Personal Computer and the Expandable Personal Computer, for differing needs and price ranges. The HS-148 Compact PC is an ideal start for business, educational, and home users with everything needed to begin personal computing in a compact and space efficient cabinet. Or use it as an inexpensive, intelligent workstation in a local area network. The HS-158 Expandable PC offers all the features of the HS-148 PC plus the ability to add on as desired. And both are available in ready-to-use assembled versions.

A low-cost system, the HS-148 Compact PC comes equipped with 256K of memory that can be expanded up to 640K. Advanced 256K memory chips are used to increase RAM on the main board without using an expansion card. Most any IBM PC accessory board can be used with the Compact PC by inserting it into the optional ZA-141-1 Expansion Board that plugs into the computer's main board. The Expansion Board also includes sockets for on-board ROM based software.

A fully expandable system, the HS-158 Personal Computer is a total performer. It has a standard 256K of memory that can easily be increased to 640K by adding 256K chips to the CPU board. And this Heathkit PC features six open IBM-compatible slots that can accept most any off-the-shelf accessory boards designed for the IBM-PC. Future expansion couldn't be easier with increased hardware flexibility and, in turn, more choices from a wider variety of software and peripherals to meet your changing computer needs.

Both computers are designed around the 16-bit 8088 microprocessor, the same as used in the IBM-PC. This allows the Heathkit HS-148 and HS-158 IBM-compatibles to run 99% of all IBM-PC software. With this compatibility you can access a huge and growing amount of applications software for the IBM-PC. And you can run most of them right out of the box without any program alterations.

Shift your Heathkit PCs into high gear with a special "high speed" switch. An external operator-selectable switch allows you to increase the operating speed from 4.77 MHz to 8 MHz (some programs may run only at 4.77 MHz). Increase these computers number crunching ability even more with the addition of an optional 8087 math co-processor. It simply plugs into its own socket on the CPU boards of the HS-148 and HS-158 computers to supply heavy-duty number crunching. Such arithmetic-intensive activities are found in FORTRAN programs, computer-aided drafting and design software, and graphic displays.

High-capacity auxiliary storage is provided by a double-sided, double-density 5.25" disk drive that is IBM formatted and stores up to 360K bytes of data. Get your Compact or Expandable PC with one drive or with an optional second 5.25" disk drive. An optional 20 megabyte Winchester hard disk drive is also available for installation in HS-158 Expandable Personal Computers for those needing the capacity to handle larger, more comprehensive business programs.

Two video outputs are available at the rear panel of both the Compact and Expandable Personal Computers. One output is a standard nine-pin D connector for connecting an external RGB color monitor and the other is a phono plug for a monochrome monitor. In the character mode, you have a 25 line by 80 character display with a selectable 8 background colors and 16 foreground colors. In the graphics mode, each pixel (dot) of a 320 x 200 pixel area can be painted in one of four colors selected from one of two color palettes. Color displays on a monochrome monitor are represented by a corresponding gray level.

Increased video resolution for the HS-158 Expandable Personal Computer is made possible by installing a Z-319 Bit-Mapped Video Graphics Card with its 192 kilobytes of usable video RAM. This optional card enables the HS-158 PC to produce high resolution 8-color bit-mapped graphics on a 640 x 225 pixel area. More colors are possible by blending the eight available colors. With the Z-319 Card installed, the HS-158 PC can produce any graphics display that can be created on the advanced H-100 Computer. Or, add an optional H-329 Monochrome Video Card to either the HS-148 Compact (requires the ZA-141-1 Expansion Board) or the HS-158 Expandable PC. This card provides an IBM monochrome card output for use with special monitors like the ZVM-1240 on page 95.

Improved video is one of the obvious advantages of the HS-148 Compact and HS-158 Expandable PCs. A complete absence of video flickering during scrolling and a substantial improvement in the speed at which text is displayed is a very big plus for users. The display is also much clearer, achieved by special circuitry that removes video interference. In addition, both computer versions offer ROM or software selected smooth and jump scrolling.

A serial port and a parallel communication port provide these computers with the flexibility to use dot matrix and letter quality printers, modems, and other peripheral devices. The serial I/O port has a standard EIA RS-232 DTE connector and is capable of baud rates between 110 and 9600 while operating in asynchronous full or half duplex. The parallel interface is a Centronics compatible port using a 25-pin D connector. The ports are configured to peripherals using a simple menu-driven program supplied with the operating system software. Selections are made from on-screen choices and many pre-defined configurations are available for many popular printers and modems.

A detached low-profile keyboard adds to the ease of use for both Compact and Expandable PCs. It is an electronic keyboard with 84 keys and 57 alpha-numeric keys that are laid out like Selectric-style keyboards. LED status lights indicate CAPS LOCK and NUM LOCK conditions. The keyboard has an L-shaped return key and double-wide shift key for easier word processing. All keys have a positive tactile feedback for faster typing and a switchable electronic key click. The keyboard is sculpted and each key repeats itself when held down with the rate increasing as the key is held down longer.

Special function keys and a numeric keypad are also contained on the keyboard. Ten function keys line up to the left of the keyboard and a 17-key keypad is clustered at the right. An additional ENTER key is located on the keypad. This key becomes very useful when many numbers must be entered when using accounting programs and large spreadsheets.

Full programmable sound capability. Both the Compact and Expandable Personal Computer have the benefit of fully programmable sound. There is one voice, and you can program it by both frequency and duration. This sound capability enhances both computer games and instructional applications.

Built-in diagnostics are initiated every time you first turn on the Compact or Expandable PC. Should a hardware problem be detected, an error message in clear, plain English text appears on the screen. In addition, the computer contains a diagnostic Help facility for access to more detailed diagnostic information.

The HS-148 Compact and the HS-158 Expandable PCs are designed to take up little work space. They both use a separate monitor which may sit on top of the computer or beside it. With their small "footprint" these machines will easily fit on existing desk space in office environments and make the best use of a desktop's area without cramping your movements.

Excellent documentation is provided with each computer and takes into account the various needs of users and their different experience levels. All kits contain assembly manuals that are clearly instructive and carefully illustrated. All kit and assembled computers include basic user's information such as plugging in cables and booting the computer for fast and easy computer access without paging through a computer system explanation. Also provided is more detailed information about your new system's operating procedures, diagnostics, maintenance steps, and troubleshooting procedures.

Free MS-DOS operating system: All kit and assembled HS-148 and HS-158 PCs include MS-DOS and a diagnostics disk.

Free Microsoft Windows with every Winchester equipped kit or assembled HS-158 Expandable PC. Or free with every Winchester upgrade kit. Just include Windows (MS-5063-30) on your order blank and write "No Charge" in the price column. Shipping weight each, 2 lbs.

Heathkit **Kit HS-148-41,** Compact Personal Computer with monochrome and color capability, 256K RAM, one 5.25" disk drive with 360K total storage, and the MS-DOS operating system. Includes FREE HVM-122A Monochrome Monitor.
Shpg. wt. 25 lbs. ..... **Was $999.00 Now Only 899.00**

Zenith data systems **ZF-148-41,** Assembled Compact Personal Computer with monochrome and color capability, 256K RAM, one 5.25" disk drive with 360K total storage, and the MS-DOS operating system.
Shpg. wt. 28 lbs. ..... **Was $1499.00 Now Only 1299.00**

Zenith data systems **ZF-148-42,** Assembled Compact Personal Computer with monochrome and color capability, 256K RAM, two 5.25" disk drives with 720K total storage, and the MS-DOS operating system.
Shpg. wt. 30 lbs. ..... **Was $1799.00 Now Only 1499.00**

Heathkit **Kit HS-158-41,** Expandable Personal Computer with monochrome and color capability, 256K RAM, one 5.25" disk drive with 360K total storage, and the MS-DOS operating system.
Shpg. wt. 25 lbs. **1599.00**

Zenith data systems **ZF-158-41,** Assembled Expandable Personal Computer with monochrome and color capability, 256K RAM, one 5.25" disk drive with 360K total storage, and the MS-DOS operating system.
Shpg. wt. 38 lbs. **2299.00**

Zenith data systems **ZF-158-42,** Assembled Expandable Personal Computer with monochrome and color capability, 256K RAM, two 5.25" disk drives with 720K total storage, and the MS-DOS operating system.
Shpg. wt. 41 lbs. **2499.00**

Zenith data systems **ZW-158-43,** Assembled Expandable Personal Computer with monochrome and color capability, 256K RAM, a 20MB Winchester hard disk drive and one 5.25" disk drive with 360K total storage, and the MS-DOS operating system. See above for FREE Microsoft Windows Software offer.
Shpg. wt. 42 lbs. **3699.00**

HS-317-20, Winchester Upgrade Kit for installing a 20 megabyte hard disk drive into only the HS-158 Expandable Personal Computer. This Upgrade Kit includes everything you'll need for installation: controller board, 5.25" Winchester hard disk drive, and mounting hardware. Also included are step-by-step instructions on how to partially disassemble your HS-158 Computer and its existing drives so you can properly install the Winchester drive. See above for FREE Microsoft Windows Software offer. Shpg. wt. 16 lbs. **1195.00**

Z-316-8, 8 MHz 8087 Numeric Co-processor simply installs into socket on CPU board of HS-148 or HS-158 Computers to give superior arithmetic and handling capabilities. Shpg. wt 1 lb. **285.00**

Z-205-4, 256K Memory Chip Set, a set of nine memory expansion chips for increasing the RAM memory capability of HS-148 Compact and HS-158 Expandable Personal Computers. Shpg. wt. 1 lb. **199.00**

NEW! Z-304, Async Serial Port provides one sync/async port for use with terminal emulation packages. Shpg. wt. 2 lbs. **249.00**

ZA-141-1, Expansion Board for HS-148 Compact PCs. Plugs into main board of computer and allows the addition of one accessory card. Also includes sockets for on-board ROMs. Shpg. wt. 2 lbs. ..... **Was $149.00 Now Only 99.00**

Z-319, Assembled Bit-Mapped Video Graphics Card provides a high-resolution, 8-color, 640 x 225 pixel display (640 x 512 interlaced) of both alphanumeric characters and graphics. Enables emulation of H-100 Computer video attributes and uses mapping to functionally emulate the keys of an H-100 keyboard. Requires MS-DOS (OS-63-31) and the MS-DOS Enhancement (OS-63-32).
Shpg. wt. 1 lb. **424.00**

SAVER! Purchase both the Z-319 Video Card and the MS-DOS Enhancement (OS-63-32) operating system and save over separate costs.
ZSS-100-27, Shpg. wt. 12 lbs. **449.00**

Kit H-329, Monochrome Video Card for use with HS-148 Compact (requires ZA-141-1 Expansion Board) and HS-158 Expandable PCs. It provides a high resolution video output compatible with the output from an IBM monochrome video card. Shpg. wt. 3 lbs. **159.95**

Z-329, Assembled H-329, Shpg. wt. 2 lbs. **200.00**

ZVM-124, 12-inch diagonal non-glare amber display monitor. This fully assembled TTL input monitor offers a 720 x 350 pixel resolution and is used with high resolution video boards such as the H-329 Card. Has an attached 9-pin D connector video cable for plugging into the H-329 Card. Bandwidth is 18 MHz. Has front panel ON/OFF button and red power LED. Front door conceals contrast, brightness, horizontal hold and vertical size controls. Horizontal size and 40/80 column switch are located back of the monitor. Uses hooded male IEC AC power connector for plugging into the back of an IBM PC. UL approved and CSA certified. Shpg. wt. 18 lbs. **199.00**

Kit HVM-122A, 12-inch diagonal monochrome monitor with a non-glare amber screen. Uses a composite video input with switchable 40 or 80 character screen. See page 95 for further details. Shpg. wt. 22 lbs. **79.95**

TM-150, Programmer's Reference Manual provides information about the features of the HS-151 Personal and HS-161 Portable Computer as related to programming and interfacing, Shpg. wt. 3 lbs. **25.00**

TM-140, Technical manual for the HS-148 and Z-138 Compact Personal Computers. Includes theory of operation, circuit descriptions, and block schematics. Shpg. wt. 3 lbs. **49.00**

COMPACT AND EXPANDABLE PC $AVERS

Take 50% off the price of these selected items when you purchase them within 90 days of buying either a kit or assembled HS-148 Compact or HS-158 Expandable Personal Computer. A copy of the computer purchase receipt is required.

Any three Heath/Zenith software packages.
Z-205-4, 256K Memory Chip Set.
Z-316-8, 8 MHz 8087 Numeric Co-Processor.
Z-207-7, Optional 5.25" floppy disk drive kit (kit versions only).
H-329, High Resolution Video Card (H/Z-158 Computers only).
ZVM-124, High Resolution Monitor (H/Z-158 Computers only).

HS-148 and HS-158 SPECIFICATIONS: Processor: 8088 with switchable 5MHz/8MHz operating speed. **Memory:** 256K of dynamic RAM expandable to 640K. **Drive:** Single or dual 5.25" double-sided, double-density 48 TPI floppy drives that are IBM PC formatted for 360K byte storage. **Display Graphics:** 640 x 200 dot addressable pixels in monochrome; 320 x 200 pixels in color, each pixel can be 1 of 4 colors selectable from 1 of 2 color palettes. Characters can be 1 of 8 background colors with 1 of 16 foreground colors. **Video:** Both RGB with intensity and composit monochrome outputs provided. Standard 9-pin D connector for RGB monitors, sync polarity is selectable positive or negative. Standard phono type connector for monochrome output, color displayed by corresponding gray level. **Keyboard:** Detached low-profile with 10 function keys, 17 key calculator keypad, 57 alphanumeric, caps and numeric lock indicator, audible click on keystroke, and auto repeat with rate advance. **Cursor:** Blinking, underline, or reverse. **Cursor Controls:** Up, down, left, right, home. **Cursor Addressing:** Relative or direct. **Tab:** 8 columns. **Bell:** Audible alarm on receipt of ASCII BEL command. **Edit Functions:** Insert and delete character or line. **Erase Functions:** Erase line, to beginning of line, to end of page, to end of line. **Serial I/O Ports:** EIA RS-232 standard DTE connector, 110 to 9600 baud rate, asynchronous full or half duplex. **Parallel I/O Port:** Female Centronics compatible 25-pin D connector. **Expansion Capability: HS-148:** Optional daughter board provides full-size internal IBM-compatible card slot, plus connector to external expansion box. **HS-158:** Six card slots available. **Power Requirements:** 120/240 VAC at 50/60 Hz. **Dimensions: HS-148:** 16" W x 4.8" H x 16.1" D (40.6 x 12.2 x 40.9 cm). **HS-158:** 16" W x 6.25" H x 16.5" D (40.6 x 15.9 x 41.9 cm). **Weight: HS-148:** 22.5 lbs. (10.2 kg). **HS-158:** 42 lbs. (18.9 kg).

More Accessory Boards can be found on pages 98 and 99.

NEW HS-241 Advanced PC with optional monitor and second floppy disk drive

H-100 Low-Profile Computer with optional ZVM-135 and second floppy disk drive

H-100 All-In-One Desktop Computer with build-in 12-inch display and optional second disk drive

1 The New HS-241 Advanced Personal Computer

NEW

FREE Microsoft Windows software with every kit or assembled Advanced PC ordered with an optional Winchester drive. Enter software model number MS-5063-30 on your order form and "No Charge" in the price column. Shipping weight for the software is 2 lbs.

Handle a lot more work and do it faster and easier with the HS-241 Advanced Personal Computer. Based on the 80286 microprocessor, this computer puts at your fingertips unparalleled processing speed, extensive data storage capacity, and IBM PC-AT compatibility. And with its built-in flexibility this Advanced PC lets you expand in any direction, even into cost-effective local area networking.

Meet the demands of applications software that require increasing amounts of user memory. The HS-241 Advanced PC comes equipped with a standard 512K of RAM to satisfy most all memory requirements. When more memory is needed you can easily and economically add up to 3 MB by plugging in two fully loaded Z-405 Memory Cards. The HS-241 Computer can handle up to 15 MB of RAM.

Extensive data storage. The HS-241 Advanced PC is available in kit or assembled versions with a single 1.2MB 5.25" floppy disk drive. Optional 20MB and 40MB Winchester drives are other choices for increased data storage. The HS-241 PC comes with a controller card that can handle up to two floppy and three hard disk drives. A second 360K byte floppy drive is also available to simplify the transfer of PC software to the HS-241 Advanced Computer.

Optional video cards offer you economical color, graphics, and high resolution options so you can choose a video output that best fits your computer's purpose. Virtually any PC video card works in the HS-241 Advanced PC.

The MS-DOS operating system is included free with both kit and assembled computers while GW-BASIC is included free with all kit computers. The Advanced PC features seven open expansion slots (two 8-bit, four 8/16-bit, one video), a serial and a Centronics port, English labelled keyboard, and a 6 MHz clock.

Heathkit **Kit HS-241,** Advanced PC with 512K RAM, one 1.2MB floppy disk drive, MS-DOS and GW-BASIC. Requires optional video card for monochrome or color output. Shpg. wt. 65 lbs. **2899.00**

Zenith data systems **ZF-241-81,** Assembled Advanced PC with 512K RAM, one 1.2MB floppy disk drive and MS-DOS. Requires video card for monochrome or color video output. Shpg. wt. 52 lbs. **3999.00**

Z-207-7, 5.25" 360K Floppy Disk Drive, Shpg. wt. 5 lbs. **250.00**
Z-205-4, 256K RAM Chip Set, Shpg. wt. 1 lb. **199.00**
Z-405, 1.5MB Memory Board, 128K installed, 2 lbs. **399.00**
Z-409, Standard Video Card with monochrome and RGB outputs, and a 320 x 200 pixel resolution. Shpg. wt. 2 lbs. **239.00**
Z-329, High Resolution Monochrome Video Card, Shpg. wt. 2 lbs. **200.00**
Z-416, 80287 Numeric Co-Processor, Shpg. wt. 1 lb. **205.00**
ZD-12, Optional 5.25" 1.2MB Floppy Disk Drive, Shpg. wt. 5 lbs. **599.00**
ZD-200, Optional 20MB Winchester Disk Drive, Shpg. wt. 9 lbs. **1499.00**
ZD-400, Optional 40MB Winchester Disk Drive, Shpg. wt. 9 lbs. **2499.00**
Z-417-1, Winchester Cable, required for the installation of either a 20 MB or a 40 MB Winchester drive into an HS-241 PC without a Winchester drive. 1 lb. **20.00**
HCA-200PC, Serial Cable. A six foot cable with a 9-pin IBM AT-compatible D connector to a 25-pin D connector for use with the HS-241 Computer's serial output. Shpg. wt. 1 lb. **35.00**
TM-240, Technical Manual for the HS-241, Shpg. wt. 3 lbs. **49.00**

50% OFF! HS-241 ADVANCED PC $AVERS

Get a big 50% discount on the following items when you buy them within 90 days of any kit or assembled HS-241 PC purchase. Receipt required.

Any three Heath/Zenith software packages.
Z-205-4, 256K RAM Chip Set.
Z-409, Video Card.
H-329 or Z-329, High Resolution Video Card (see page 85).
ZVM-124, High Resolution monitor (see page 85).
Z-405, 1.5 Megabyte Memory Board.
Z-416, 80287 Numeric Co-Processor.
Z-207-7, 360K 5.25" Disk Drive.
ZD-12, 1.2 Megabyte Floppy Drive.
Z-417-1, Winchester Cable.
ZD-200, 20 Megabyte Winchester Drive.
ZD-400, 40 Megabyte Winchester Drive.
TM-240, Technical Manual.

HS-241 SPECIFICATIONS: Memory: 512K of RAM, 64K ROM, 4K special RAM. **Video:** Optional. **Keyboard:** Detached low-profile with 10 function keys; 57 alphanumeric; lit caps: numeric and scroll lock; audible click on key press; and auto-repeat with rate advance. **Cursor:** Blinking, underline, or reverse. **Cursor Controls:** Up, down, left, right, home, end, page up, and page down. **Clock:** Continuous running real time clock with nickel-cadmium battery. **Diagnostics:** Automatic power-on with LED indicators; ROM-based user-invoked LED display; and optional disk-based diagnostics. **Serial I/O Port:** A 9-pin IBM PC AT-compatible connector; asynchronous; 110 – 19,200 baud rate; and supports both full and half duplex operation. Odd, even, or null parity. **Parallel I/O Port:** Female connector Centronics compatible. **Expansion Capability:** 10 bus slots with 7 empty and available for expansion. **Power Requirements:** 110/220 VAC at 50/60 Hz. **Dimensions:** 21" W x 16.5" D x 6.5" H. **Weight:** 35 lbs. with single floppy drive.

2 The H-100 Desktop Computer with advanced features

Low-Profile

$1599.00 Kit

Lowest prices ever on assembled models

The H-100 Desktop Computer features dual microprocessors for running 8 and 16-bit software plus S-100 expansion slots so you can take advantage of advancing technology. In addition, the H-100 offers high speed processing, large capacity disk storage, easy-to-use keyboard, high resolution graphics capability, and an expandable memory.

The H-100 Desktop Computer is an exceptionally advanced computer with a conveniently flexible and easily expandable system to meet your growing business and personal needs. It has two microprocessors that allow you to use sophisticated 16-bit MS-DOS applications software, and also to run most of today's

existing CP/M 8-bit software programs...now totalling more than 10,000.

Work faster and save precious time with an H-100 Computer that operates at 8 MHz (some assembled models operate at 5 MHz). You'll be able to run application programs faster, search data bases faster, and compile and assemble programs faster. Add an 8087 numeric co-processor to increase the operating efficiency of applications requiring math-intensive operations.

Standard 256K RAM and high capacity storage. All H-100 Computers are equipped with 256K RAM that's easily expandable to 768K on the motherboard, without wasting expansion slots. A high capacity 5.25" disk drive adds fast operational speed and efficiency. And add on an optional 5.25" disk drive for even greater storage capability. Each double-sided double-density drive has a 320 kilobyte storage capacity. Or choose an 11MB Winchester rigid disk to conveniently store massive amounts of data.

The H-100 Computer is available in two models, All-In-One and Low-Profile. The All-In-One is equipped with a built-in high-resolution 12" monochrome video display that presents an easy-to-read 25 line by 80 character display. Screen colors are available in non-glare green, amber or white. Both models offer monochrome and color video outputs. Control 144,000 individual dots on a 640 x 225 pixel area for highly detailed drawings and graphs.

Designed for easy expansion, the H-100 Computer features four open industry standard IEEE 696 S-100 slots to accommodate most any peripheral. Also expand using three communication ports, one parallel and two serial, for total communications flexibility without using a single expansion slot.

An easy-to-use sculptured typewriter-style keyboard allows you to work faster and more accurately than ever before. Ninety-five feather-touch keys reduce fatigue, even after hours of operation. Twelve special function keys are software definable to save time and reduce work. A software controlled HELP key also adds to the users ease of operation. Cursor control keys are located on a separate professional 18-key numeric keypad. Special insert and delete keys for both characters and lines simplify insert and editing of text and data.

A high-efficiency power supply within the H-100 Computer saves energy and provides more than enough power to supply the requirments of a fully populated computer. This power supply won't let you down and won't slow your drives down when you fill all the expansion slots

This MS-DOS operating system is included FREE with all H-100 Computers, both kit and assembled. All assembled Z-100s include the popular LOTUS 1-2-3 integrated software package.

Heathkit **Kit HSA-1128-41,** All-In-One with monochrome graphics, non-glare amber CRT, 256K RAM, one 5.25" drive for 320K bytes of storage, 8 MHz operation, and MS-DOS, Shpg. wt. 112 lbs. **1699.00**

Heathkit **Kit HSG-1128-41,** All-In-One with monochrome graphics, non-glare green CRT, 256K RAM, one 5.25" drive for 320K bytes of storage, 8 MHz operation, and MS-DOS, Shpg. wt. 112 lbs. **1699.00**

Heathkit **Kit HSW-1128-41,** All-In-One with monochrome graphics, non-glare white CRT, 256K RAM, one 5.25" drive for 320K bytes of storage, 8 MHz operation, and MS-DOS, Shpg. wt. 112 lbs. **1679.00**

Heathkit **Kit HS-1108-41,** Low-Profile with 256K RAM, one 5.25" drive for 320K storage, 8 MHz operation and MS-DOS.
Shpg. wt. 89 lbs. **1599.00**

Zenith data systems **ZF-118-42,** Assembled Low-Profile with monochrome graphics, 256K RAM, two 5.25" drives for 640K bytes of storage, 8 MHz operation, and MS-DOS and LOTUS 1-2-3.
Shpg. wt. 54 lbs. Mtr. Frt. **2399.00**

Zenith data systems **ZFG-121-32,** Assembled H-100 with a non-glare green CRT, 192K RAM, two 5.25" drives for 640K bytes of storage, 5 MHz operation, and MS-DOS and LOTUS 1-2-3.
Shpg. wt. 68 lbs. Mtr. Frt. **2499.00**

Zenith data systems **ZW-118-42,** Assembled Low-Profile with internal 11 MB Winchester, one 5.25" drive with 320K bytes of storage, 256K RAM, 8 MHz operation, plus MS-DOS and LOTUS 1-2-3.
Shpg. wt. 55 lbs. **3399.00**

Zenith data systems **ZWG-121-32,** Assembled All-In-One with internal 11 MB Winchester, one 320K 5.25" drive, 192K RAM, 5 MHz operation, plus MS-DOS and LOTUS 1-2-3 software.
Shpg. wt. 70 lbs. Mtr. Frt. **3499.00**

For additional second 5.25" disk drives for H/Z-100 Computers with one drive, visit your nearest Heath/Zenith Computers & Electronics Center (consult telephone white pages) or call TOLL-FREE 800-253-7057 from 8 AM to 4:30 PM ET, Monday thru Friday. Alaska and Michigan residents call 616-982-3411.

Winchester Upgrade Kit allows you to replace an existing 5.25" floppy drive in an H-100 Computer with a 5.25" Winchester rigid disk drive. The Winchester Upgrade Kit is for use with H-100 Computers only. For use in assembled Z-100 Computers, contact Heath Customer Service or, contact your nearest Heath/Zenith Computers & Electronics Center. (See page 52)

HS-217, For models with full height drives, Shpg. wt. 33 lbs. **999.00**

HS-217A, For models with half height drives, Shpg. wt. 30 lbs. **999.00**

HA-108, 8 MHz Conversion Kit for H-100 kit computers equipped with half-height drives. Converts these kits from 5 MHz operation to 8 MHz operation. Also adds 256K RAM chip capability (one included) and enables RAM expansion on the main board up to 768K. For remaining kit and assembled H-100 Computers call Heath Co. TOLL-FREE at 800-253-7057 from 8 A.M. to 4:30 P.M. Or contact your nearest Heath/Zenith Computers & Electronics Center.
Shpg. wt. 2 lbs. **249.95**

Z-205-4, 256K RAM Chip Set for use in extending the RAM capability of 8 MHz H-100 Computers, Shpg. wt. 1 lb. **199.00**

Z-216-8, 8087 Numeric Co-Processor for H/Z-100 Computers operating at 8 MHz. Shpg. wt. 2 lbs. **429.00**

Z-205-1, RAM Upgrade package for use only with 5 MHz operation H/Z-100 Computers and provides 64K of RAM. Shpg. wt. 1 lb. **79.99**

Z-205, Expansion RAM Card gives your H/Z-100 Computer an additional 256K of memory (requires 192K of RAM on main computer board). For use only in 5 MHz operating H/Z-100 Computers. Card is fully populated.
Shpg. wt. 2 lbs. **599.00**

Z-219-1, One Color Video RAM Chip set, two sets are required to upgrade H-100 Computers with monochrome outputs to color capability.
Shpg. wt. 1 lb. **74.99**

TM-100, H/Z-100 Technical Manuals, Shpg. wt. 22 lbs. **110.00**

50% OFF! H-100 DESKTOP $AVERS

Get a big 50% discount on any or all of the following selected items when you buy them within 90 days of any kit or assembled H-100 Computer purchase. Computer purchase receipt or copy is required.

Any three Heath/Zenith software packages.
PC-250, UCI IBM PC Emulator (Assembled 100s only).
PC-251, Gemini IBM PC Emulator (Assembled 100s only).
Z-205-4, 256K RAM Chip Set.
Z-216-8, 8087 Numeric Co-Processor.
Two Z-219-1 Color Chip Sets.

Run IBM PC software on your H/Z-100 Desktop Computer

Two new IBM PC Emulators enable the H/Z-100 Computer to run many (but not all) IBM PC applications programs. Load and run IBM PC versions of LOTUS 1-2-3, WordStar, Multiplan and other popular business programs while retaining all the capabilities and features of your H/Z-100. These emulators allow you to use software that does not bypass ROM BIOS and does not directly control hardware elements in the computer such as printer ports and drive access. Both emulators are totally transparent to the computer when it is in the 100 mode of operation and they work equally well at 4.77 MHz or 8 MHz. Both require PC operating system.

These new emulators plug into the H/Z-100 Computer and do not conflict with the computer's hardware. Each system supports IBM PC software only and does not allow IBM PC accessories to work on the H/Z-100 Computer. Both emulators also have 90-day unconditional guarantees, either you're satisfied with the emulators or we'll refund your money.

EASY PC from UCI Corporation uses a hardware approach to IBM PC compatibility for the H/Z-100. This emulator consists of three separate boards (but uses only one expansion slot), a video board, a floppy disk controller board, and an add-on PC system board to the H/Z-100 motherboard. A remote audio speaker is also included. This system features PC compatibility for color graphics video, audio support for program sound effects, and Winchester support.

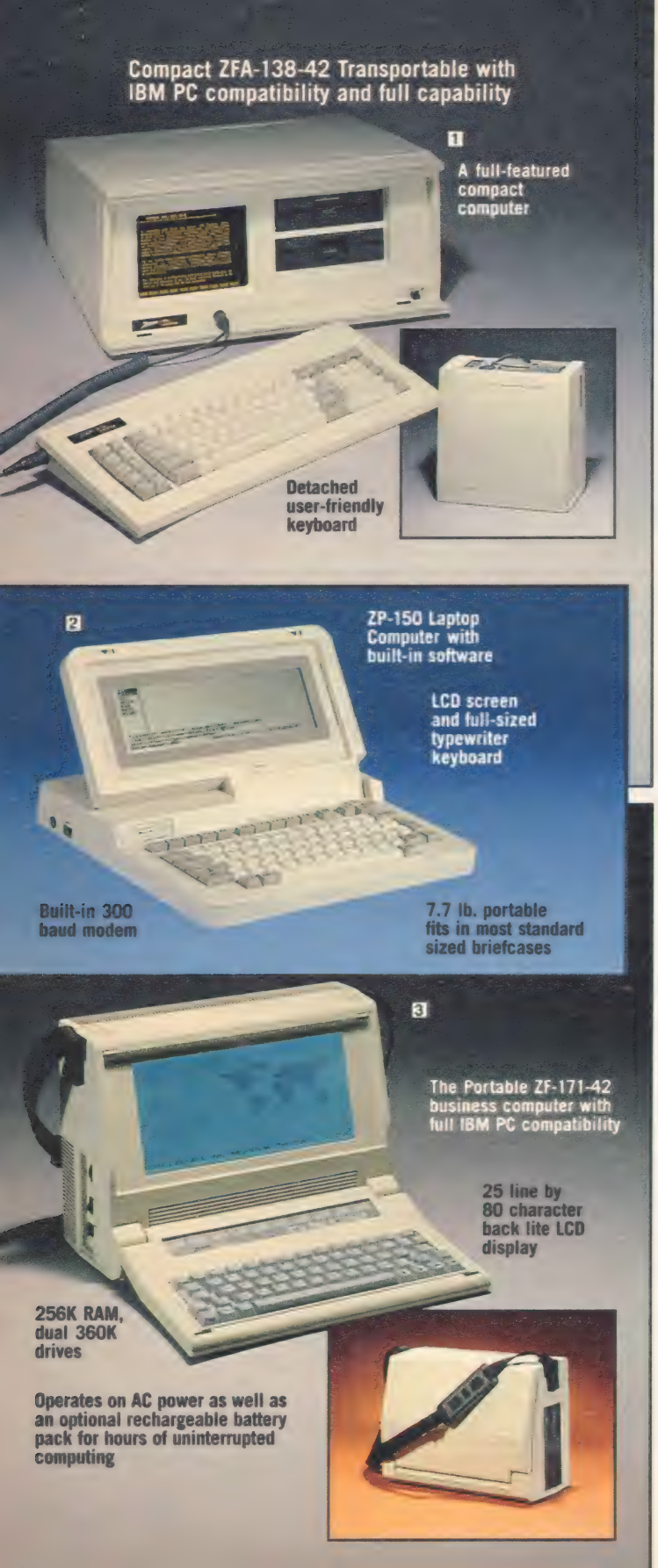
PC-250, Shpg. wt. 3 lbs. **699.00**

Gemini H/Z-100/IBM PC Emulator from D.E.L. Professional Systems Ltd. uses software emulation to allow H/Z-100 Computers to run many software programs designed for the IBM PC. The Gemini Emulator uses one plug-in circuit board to the H/Z-100 motherboard to achieve PC compatibility. This emulator also contains a socket for an optional 8087 numeric co-processor which is accessible even while operating in the 100 mode.

PC-251, Shpg. wt. 2 lbs. **599.00**

$AVER! Purchase either the PC-250 EASY PC or the PC-251 Gemini emulators and get MS-DOS (OS-63-31) for PCs. Regularly $150.00 ..... **90.00**

More accessory boards are located on pages 98 and 99.


Compact ZFA-138-42 Transportable with IBM PC compatibility and full capability
1
A full-featured compact computer
Detached user-friendly keyboard
2
ZP-150 Laptop Computer with built-in software
LCD screen and full-sized typewriter keyboard
Built-in 300 baud modem
7.7 lb. portable fits in most standard sized briefcases
3
The Portable ZF-171-42 business computer with full IBM PC compatibility
25 line by 80 character back lite LCD display
256K RAM, dual 360K drives
Operates on AC power as well as an optional rechargeable battery pack for hours of uninterrupted computing

1 All the power of a desktop PC in a compact and portable computer with IBM PC compatibility

Reduced to **$999.00**

Get full personal computer capability in less space and at a lower cost than comparably equipped desktop computers. The new compact Z-138 Transportable Computer packs all the power of a desktop into a small, total performer that helps you keep pace with business no matter where it occurs.

Take full IBM compatibility on the road and take along all the business tools that you used back at the office on your desktop computer. The Z-138 Transportable Computer provides you with all the features and all the performance that you get from an office desktop. And you get the ability to access the complete software library of advanced 16 bit software developed for the IBM PC. The Z-138 PC offers considerably more processing speed, is far lighter, less costly and is easily expandable as compared to other transportables.

Based on the same 8088 16 bit microprocessor as the IBM PC, the Z-138 Transportable not only offers 4.77 MHz operation, but it can also be manually switched to operate at a faster 8 MHz. This allows you to take advantage of the latest software developments without sacrificing compatibility for software requiring slower speeds. And add an 8 MHz co-processor for faster math-intensive operations.

Memory and data storage capability to do the job. The Z-138 Compact Transportable is equipped with a standard 256K user memory that can handle most any software application. And if more user memory is ever required, RAM can be easily expanded up to 640K on the memory board by adding plug-in Z-205-4 Memory Chip Sets. Large data storage potential is also offered by the Z-138 Compact PC. Each of the computer's IBM standard format double-sided, double-density 5.25" floppy disk drives is capable of storing up to 360K bytes of data. Together these two floppy drives provide up to 720K bytes of total storage.

Get real communications flexibility with this computer's standard RS-232C serial port and a Centronics parallel port. Connect off-the-shelf IBM PC type printers, modems, hard disk drives, and other peripherals when you need them. And, an optional internal IBM-compatible expansion slot can be added via a main board plug with the Z-130-1 Expansion Card for IBM PC accessory cards.

A 7" diagonal amber monitor is built into the Z-138 Transportable. The screen displays a full 25 lines x 80 characters and also has full graphics capabilities. A gray scale function allows programming of color intensities. Separate external RGB and composite video outputs are available for the connection of external monochrome or color video monitors to make your expressive graphic presentations even more appealing.

The same enhanced detached keyboard found on all the other popular Heath/Zenith Personal Computers is used in the Z-138 Transportable. This keyboard has user-friendly features such as an L-shaped return key, plus and minus on a separate numeric keypad, caps lock and numbers lock LED status indicators, and ten programmable special function keys.

Built-in diagnostics make it easy to detect and correct potential hardware problems. Self-test diagnostics start when you turn on the computer. Should a problem exist, an error message in clear English text appears. In addition, a diagnostic Help facility provides access to more detailed diagnostic information.

FREE software with the Z-138 Compact Transportable. The MS-DOS operating system, the multiple-window word processor Word, and the electronic spreadsheet Multiplan from Microsoft are included at no charge. These three popular software packages, valued at over $700.00, supply powerful and time-saving solutions to most any business or personal needs.

ZFA-138-42, Assembled Compact Transportable PC with 256K RAM, two 5.25" disk drives capable of storing 720K bytes of data, 7" amber CRT, 8 MHz operation, and monochrome and color capability. Shpg. wt. 35 lbs. ..... **Was $1990.00 Now Only 999.00**

Z-130-1, Internal Expansion Card, 2 lbs. ..... **Was $149.00 Now 99.00**

Z-316-8, 8 MHz 8087 Numeric Co-Processor for increasing the speed of math-intensive programs, Shpg. wt. 1 lb. **285.00**

50% OFF Z-138 COMPACT PC $AVERS

Save 50% on the following selected items when you buy them within 90 days of purchasing a Z-138 Compact Transportable PC. Computer purchase receipt required.

Any three Heath/Zenith software packages.

Z-130-1, Internal Expansion Card.

Z-205-4, 256K Memory Upgrade Chip Set.

Z-316-8, 8 MHz 8087 Co-Processor.

2 A truly portable lap-sized personal computer with the power of six built-in Microsoft programs

Save $100

$899.00

Includes FREE software

Microsoft WORKS included FREE. In ROM are:

WORD, a flexible word processor
PLAN, popular Multiplan spreadsheet
BASIC, a subset of GW-BASIC
FILE, data base management
CALENDAR, tracks appointments with alarm
TELECOM, for telecommunications

From traveling business people to note-taking students, the Heath/Zenith ZP-150 Laptop Personal Computer is a real solution to many problems. The ZP-150 Laptop's compact size, battery power supply, and built-in Microsoft programs make it an invaluable tool for active people who don't have time to sit in front of a desktop computer. And the ZP-150 easily fits in most standard size briefcases.

Six built-in Microsoft applications programs, stored in 224K of ROM, provide all the tools supplied by your desk-bound computer. Available are special customized versions of Word, Multiplan, and GW-BASIC as well as a calendar/alarm, a data base management filer, and a telecommunications program. A built-in calculator with memory is available from within any of the six application programs.

Produce letters, memos, and reports easily and efficiently with Word, a flexible word processor. Word lets you create and correct documents with some of the same features found on dedicated word processors and professional typesetting equipment. Word also lets you control the appearance of your work.

Analyze and organize numbers, and perform calculations involving elaborate formulas for both business and personal use with the electronic spreadsheet Plan. It is a dynamic worksheet that can contain text, numbers, or formulas to help you examine and use the relationships between values in different parts of a spreadsheet 255 rows long by 63 columns wide.

Write and execute your own application programs using built-in BASIC. A powerful and easy-to-use programming language, this version is a very large subset of Microsoft's GW-BASIC for desktop computers.

Keep track of appointments with the ZP-150 Laptop's built-in calendar. Even have an alarm remind you of them. The interactive clock/calendar program consists of a daily diary that lets you view a detailed schedule for any given day and a monthly calendar that lets you see the days of any month where activities are scheduled or to be scheduled. You can even set a priority level for scheduled events.

Create your own information filing and retrieval system using the File data base. Create, delete, and edit records that keep track of inventory, billing, mailing lists, or any record that you want to keep. Organize data the way you want and be able to exchange the information between any two data bases or with Word and Plan application programs. File can hold a maximum of 4096 records with 64 fields, with each field holding up to 255 characters.

Access computer data bases, electronic mail, bulletin boards, or other computers using the built-in telecommunications program. An internal 300 baud modem is always available or connect a high speed modem for faster file transferring. You can even switch to voice for making a regular telephone call.

Store your data in 32K RAM, expandable to 416K, even when the computer is turned off. The easily readable LCD display can be tilted and the intensity adjusted for optimum viewing comfort. The Laptop is powered by 10 'AA' size alkaline batteries (not included) when not using AC power. A battery saving feature of the ZP-150 automatically shuts power off after a preset idle time. A 120 VAC adapter and carrying case are included.

SPECIAL OFFER! For a limited time only the CB-5063-27 File Transfer software is included FREE with a ZP-150 Laptop. This package offer allows you to do your computing on the road, transfer files to your desktop when you return to the office, and then reload needed information back into the Laptop for your next trip.

ZP-150, With Free WORKS software and CB-5063-27 File Transfer software, Shpg. wt. 22 lbs. ..... **Was $999.00 Now Only 899.00**

ZP-150-2, 32K RAM Module, 1 lb. ..... **Was $199.00 Now 79.00**

ZP-150-4, Printer Adapter Cable, parallel to Centronics, Shpg. wt. 1 lb. .. **19.00**

Transfer files from the Laptop to other computers

Transfer text or binary files error-free at 9600 baud between the ZP-150 Laptop, and Heath/Zenith Personal Computers or the H/Z-100 Computer using this software package. Includes female to female null modem cable to directly connect the Laptop to the RS-232C connector of a host computer. Host computer must have one 5.25" floppy drive and be using the MS-DOS operating system. Included FREE with the Heath/Zenith ZP-150 Laptop Computer.

CB-5063-27, Shpg. wt. 3 lbs. **49.00**

3 A portable personal computer with total PC performance and IBM PC compatibility

Save $300

$2399.00

The Z-171 Portable Personal Computer features all the power and performance of desktop PCs in a compact and lightweight package. Don't let its size fool you. Anything you can do in your office, you can also do in a train, car, or your backyard...and at an affordable price.

The Z-171 Portable Personal Computer is a lightweight, briefcase-sized computer that can take care of any number of personal or business computing needs. It is a portable system with all the features of a full-sized system and it can run virtually all software from IBM's vast library. It can be used as a self-contained personal computer or act as part of large computer network. And it's the right size to carry home, to the office, or into the field while small enough to hand-carry onto an airplane. No longer sacrifice features for portability.

The Z-171 Portable PC is designed to operate with MS-DOS. Using this operating system it can handle a wide variety of business and personal computing needs as well as provide practical and affordable solutions to many business computing problems. Several useful functions are available without using an operating system, accessed through keyboard pictures or icons. Pressing these icons let you change set-up options, check the time in another area of the world from a displayed world map, dial a telephone number or access a database from its directory, activate a four-function calculator which can be placed on the left or right side of the screen, and start a normal boot routine.

A backlit LCD screen permits excellent visibility of a 25 line by 80 character display at any angle and in any lighting. This is due to electroluminescent backlighting which can be adjusted to control the display's intensity. The display has full graphics capability and is compatible with the IBM PC color graphics adapter in text and graphics modes.

Extensive memory and storage capacity. The Z-171 PC comes standard with 256K of on-board memory that can easily be expanded up to 640K with affordable Z-205-4 Memory Chip Sets as you need the extra memory. Also standard are two 5.25" double-sided, double-density disk drives that are formatted in the IBM PC standard. Each drive stores up to 360K of data for a total capacity of 720K.

Other outstanding features include complete communications flexibility with a RS-232C serial port and a Centronics parallel port, a user-friendly keyboard with four cursor control keys and ten programmable function keys, and automatic self-test diagnostics when the computer is first turned on. An optional ZA-170-3 video controller allows the use of an external monochrome or color monitor.

The Z-171 Portable also features sound capabilities compatible with the IBM PC for interesting gaming and instructional applications. There is one voice which can be programmed for both frequency and duration. This computer system operates on AC power, from an included adapter, as well as an optional rechargeable battery pack. And you can utilize the extensive library of IBM compatible software through MS-DOS which is included with the computer. A demonstration disk is also included that shows you how to operate the computer.

For protection from the weather and cabinet scratches, an optional softsided padded case with external pocket, handle and shoulder strap is available.

ZF-171-42, Assembled Portable Computer with 256K RAM, two 5.25" disk drives with 720K byte storage capability, 4.77 MHz operation, 25 line x 80 character LCD display, and an AC power supply. Shpg. wt. 18 lbs. ..... **Was $2699.00 Now Only 2399.00**

ZA-170-1, Optional Battery Pack, Shpg. wt. 3 lbs. **69.00**

ZA-170-2, Optional Padded Computer Carrying Case, 3 lbs. **69.00**

ZA-170-3, Optional Internal Color Video Card, Shpg. wt. 1 lb. **229.00**

ZA-170-4, Optional Internal 300/1200 Baud Modem, 1 lb. **379.00**

Z-205-4, 256K Memory Upgrade Chip Set, Shpg. wt. 1 lb. **199.00**

TM-170, Z-171 Technical Manual, Shpg. wt. 3 lbs. ..... Please Call

50% OFF Z-171 PC $AVERS

Save 50% on any or all of the selected items when you buy them within 90 days of a Z-171 Portable PC purchase. Computer receipt required.

Any three Heath/Zenith software packages.
ZA-170-1, Z-171 PC Battery Pack.
ZA-170-2, Z-171 Carrying Case.
ZA-170-3, Z-171 Color Video Card.
ZA-170-4, Z-171 Internal 300/1200 Modem.
Z-205-4, 256K Memory Upgrade Chip Set.
TM-170, Z-171 Technical Manual.

Easy, one-stop software shopping for Heath/Zenith Computers that comes with friendly, expert technical support

Popular software packages from accounting to word processing, including operating systems and programming languages, are available for all the powerful and versatile Heath/Zenith Computers detailed on pages 84 through 89 of this catalog. You'll find familiar products like WordStar, Multiplan, Word, dBASE II, Peachtext 5000, and others. Many are designed to relieve the tedious financial and record keeping tasks encountered in all businesses. These packages are listed in easy-to-read charts on pages 91 to 94. Look over our selection of software. Then visit your nearest Heath/Zenith Computers & Electronics Center. We back all our software used on Heath/Zenith Computers with FREE support and service.

These software charts on the following pages are divided into two sections. They contain software that runs on the H/Z-100 Advanced Desktop Computer, and kit and assembled Heath Personal Computers. The Heath PCs include the HS-241 Advanced PC, the HS-158 Expandable PC, the HS-148 Compact PC, the assembled Z-138 Compact Transportable, and the Z-171 Portable PC.

We make software ordering as easy as possible. Locate the category of the software in which you are interested and note the many different packages available for the Heath/Zenith PCs and the H/Z-100 Advanced Desktop Computer. Choose a desired software package and look opposite it on the same line for the model number, its price, and the shipping weight. Take for example the category of word processing. In this section there are several popular programs listed for use with both the Heath PCs and the H/Z-100 Computer. If you are interested in WordStar for your HS-158 Expandable PC, the model number, shipping weight, and price are given in the same line as the software's name under the column heading of Heath/Zenith Personal Computers and Portable PCs.

Minimum hardware and software requirements are also given for each package. This information lets you know ahead of time what your computer must be equipped with for a particular software program to perform properly. In the same line of every product there are several numbers enclosed by parentheses. Refer to these numbers at the bottom of the chart. There you'll find information about minimum RAM requirements, whether one or two 5.25" disk drives is sufficient, which operating system to use, is a programming language required, and if other software or special accessory boards are needed for you to take full advantage of a desired software package's features. Special instructions or information is also included when needed.

Heath/Zenith Computers & Electronics Center

Stop in at any one of our 63 customer-oriented stores. Here you'll find a trained and experienced computer professional that will help you to select the best software to fit your requirements. If you are unsure that certain software packages are compatible with your computer hardware, our knowledgeable people can answer virtually any question about product compatibility with your computer system. Need advice about which software packages will work together? Our friendly and courteous staff has the answers. Just give them a try.

One very good reason to stop in at our one-stop shopping center is to check our current prices. We must constantly adjust many to stay in step with the software industry and be able to offer you the best possible prices. Some manufacturer's prices vary quite often, sometimes daily, and our press deadline times prevent us from listing the latest selling price. So, to be sure you have our up-to-date "latest" prices stop in and say "hello."

Use your Visa or MasterCard credit cards

More value-added benefits are yours when you get software for your Heath/Zenith computer from the one-stop Computers & Electronics Center. You get popular and powerful software from the same people you purchased your computer from...so you can be confident that it works on your computer. Put it on your Visa or MasterCard credit card or on a personal Heath Revolving Charge. While you're in the store, check out the special sales and discounted items on the wide range of our kit and assembled computer and electronic products.

Business leasing available. If you're a small business and unsure a computer can simplify the operation of your business and make it more efficient, talk to our friendly and knowledgeable people. They can show you how to obtain a complete computer system including software through our business leasing program. Our sales team will evaluate your requirements and put together a system that includes only the computer equipment that you need to get the job done right.

Heathkit/Zenith Computers & Electronics Centers offer every-day assistance and personalized service. Our fully-stocked retail stores feature complete demonstration facilities and expert advice to help you do what you want to on your computer. Our courteous and friendly sales teams are ready to serve you anytime you visit any of our 63 computer hardware and software one-stop shopping centers. See pages 52 and 53 for store listings or consult the white pages of the telephone directory for the nearest Computers & Electronics Center.

FREE technical support

You get a most important extra with every Heath/Zenith software package you purchase...technical support. If you should encounter a problem running any of our software on Heath/Zenith computer systems, our expert team of consultants will get your hardware and software to work together, as it should. Have a question about hardware requirements, initial boot-up procedures, initial software configuring of drives and printers, backup procedures, how to determine if a program is defective, or alternate program recommendations? Our friendly, expert technical support people have the answers. For questions about operating systems, languages, and utilities; call 616-982-3860. For questions on applications programs, call 616-982-3884. Call between 8:00 A.M. and 4:30 P.M. Eastern Time, Monday through Friday, on regular business days. Or write to our consultants at Zenith Data Systems Corporation, Software Consultation, Hilltop Road, St. Joseph, Michigan 49085.

1-STOP SOFTWARE SHOPPING

	Heath/Zenith Personal Computers and Portable PCs			H/Z-100 Advanced Desktop Computer		
	Model Number	Shpg. wt. (lbs.)	Price ($)	Model Number	Shpg. wt. (lbs.)	Price ($)
OPERATING SYSTEMS						
Concurrent CP/M*				OS-61-12	3	299.00
CP/M*(5)				OS-53-2	5	150.00
CP/M-86*(5)				OS-63-2	3	99.00
MP/M-86*(5)				OS-63-5	5	99.00
MS-DOS Vers. 2(5)						
MS-DOS Enhancement(5,12,18)	OS-63-32	2	150.00			
MS-DOS Vers. 3(2,5)	OS-63-31	5	150.00	OS-63-30	5	150.00
MS-DOS Vers. 3 Programmer's Package(2,6,7)	CB-3163-30	5	149.00	CB-3163-30	5	149.00
UCSD p-System(1,5)				OS-61-3	14	99.00
★Microsoft Windows(3,6,7)	MS-5063-30	2	99.00			
WORD PROCESSING						
MailMerge*(7,10)				MP-463-11	3	249.00
Multimate*(3,6,7)	SS-5063-1	3	495.00			
PeachText 5000*(1,6,7)	RS-463-75	3	295.00	RS-463-75	3	295.00
SpellStar*(7,10)				MP-463-6	5	149.00
Word(1,5,7)	MS-5063-9	3	375.00			
WordStar*(1,5,7)	MP-5063-10	3	299.00	MP-463-10	4	299.00
WordStar Professional*(2,5,7)	MP-5063-13	3	399.00	MP-463-17	4	399.00
WordStar Professional Option(2,5,7,10)	MP-5063-12	3	199.00			
SPREADSHEETS						
LOTUS 1-2-3(2,6,7)	LS-5063-1(16)	3	299.00	LS-463-1	4	299.00
Multiplan(1,5,7)	★MS-5063-17	3	195.00	★MS-5063-17	3	195.00
SuperCalc*(5,7)				SC-463-1	4	195.00
SuperCalc3*(1,6,7)	SC-5063-3	3	395.00			
DATA BASE MANAGEMENT SYSTEMS						
Condor* rDBMS*(1,5,7)	CD-5063-3	5	650.00	CD-5063-3	5	650.00
Condor FMS*(1,6,7)	CD-5063-2	3	199.00	CD-463-2	4	199.00
dBASE II(1,5,7)	AT-5065-1	3	495.00	AT-5065-1	3	495.00
Pecon Peachtree*/Condor Interface(2,6,7,14)	CB-5063-9	1	99.00	CB-463-9	3	99.00
Package: Condor FMS and Pecon(2,6,7,14)				ZSS-100-28	7	249.00

Minimum Computer Hardware and Software Requirements:

(1) 128K RAM
(2) 192K RAM
(3) 256K RAM
(5) One 5.25" disk drive
(6) Two 5.25" disk drives
(7) MS-DOS Operating System
(10) WordStar
(11) Z-204 Multiport I/O Card
(12) Z-319 Video Graphics Card
(14) Either Condor rDBMS or FMS and one Peachtree Accounting Package
(16) Not available by mail order. Visit your nearest Heath/Zenith Computers & Electronics Center.
(18) For H-100 mode operation

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★**Look for these new products.**

Use your Visa or MasterCard credit card to purchase your kit!

1-STOP SOFTWARE SHOPPING

	Heath/Zenith Personal Computers and Portable PCs			H/Z-100 Advanced Desktop Computer		
	Model Number	Shpg. wt. (lbs.)	Price ($)	Model Number	Shpg. wt. (lbs.)	Price ($)
ACCOUNTING						
BPI General Accounting (2,6,7,9)	**BP-5063-1**	3	595.00			
BPI General Accounting, Training	**BP-5063-71**	1	69.00			
BPI Accounts Receivable (2,6,7,9)	**BP-5603-2**	3	595.00			
BPI Accounts Payable (2,6,7,9)	**BP-5063-3**	5	595.00			
BPI Payroll (2,6,7,9)	**BP-5063-4**	3	595.00			
BPI Inventory Control (2,6,7,9)	**BP-5063-5**	3	795.00			
BPI Job Costing (2,6,7,9)	**BP-5063-6**	3	795.00			
BPI Personal Accounting (2,6,7,9)	**BP-5063-8**	1	195.00			
BPI Package: Six Accounting Programs (2,6,7,9)	**ZSS-150-6**	49	999.00			
Peachtree* General Ledger (2,6,7)	**RS-5065-1** (9)	3	499.00	**RS-463-1** (21)	5	399.00
Peachtree Accounts Receivable (2,6,7)	**RS-5065-2** (9)	3	499.00	**RS-463-2** (21)	4	399.00
Peachtree Accounts Payable (2,6,7)	**RS-5065-3** (9)	3	499.00	**RS-463-3** (21)	4	399.00
Peachtree Inventory Control (2,6,7)	**RS-5065-5** (9)	3	499.00	**RS-463-5** (21)	4	499.00
Peachtree Sales Invoicing (2,6,7)	**RS-5065-6** (9)	3	399.00	**RS-463-6** (21)	4	299.00
Peachtree Package: Six Accounting Programs (2,6,7)	**ZSS-150-7** (9)	40	999.00	**ZSS-100-24** (21)	46	999.00
Pecon Peachtree/Condor Interface (2,6,7,14)	**CB-5063-9** (9)	1	99.00	**CB-463-9** (21)	3	99.00
COMMUNICATIONS AND TERMINAL EMULATION						
CPS-150 (1,5,7)	**CB-5063-7**	3	49.00			
CPS-86 (1,5,7)				**CB-463-7**	3	40.00
CPS (8-bit) (1,5,8)				**CB-253-7**	1	40.00
★3270 Emulator (2,6,7,17)	**PO-5063-1**	3	499.00			
★3780 Emulator (2,6,7,17)	**PO-5063-2**	3	499.00			
★MT-983 Emulator (1,5,7)	**MB-463-1** (17)	2	295.00	**MB-463-1**	2	295.00
3276/8 Emulator BSC (RS-232 connection)				**PO-463-1**	2	650.00
IBM 3276/8 SNA/SDLC Emulator (RS-232 connection) (2,5,7,11)				**IE-463-2**	4	649.00
Remote Batch Terminal Emulator (1,5,7)				**WI-463-1**	4	899.00
ZSTEM-VT100 Emulator (1,5,7)	**KE-5063-1**	3	150.00	**KE-463-1**	3	149.00
COMMUNICATIONS: NETWORKING						
ZLAN* Two Computer System (5,7,15)				**ZSS-100-22**	21	1499.00
ZLAN Computer Add-On				**ZSS-100-23**	12	599.00
ZLAN 25 ft. Cable				**HCA-60**	1	20.00
ZLAN 100 ft. Cable				**HCA-61**	4	40.00
COMPUTER AIDED INSTRUCTION						
ZDS Teacher (1,5,7)				**TA-463-1**	3	299.00
ZDS Student (1,5,7)				**TA-463-2**	2	100.00

1-STOP SOFTWARE SHOPPING

	All Heathkit Personal Computers and Portable PCs			H/Z-100 Advanced Desktop Computer		
	Model Number	Shpg. wt. (lbs.)	Price ($)	Model Number	Shpg. wt. (lbs.)	Price ($)
DIAGNOSTICS						
Disk-Based Computer Tests (1,5)				CB-463-13	4	79.00
Personal Computer Diagnostics (1,5)	CB-5063-28	3	79.00			
Z-200 PC Diagnostics (3,5)	CB-3163-31	3	79.00			
DIRECTORIES						
H/Z-100 Software (3rd Party)				CB-463-15	3	25.00
GRAPHICS						
★Microsoft Write/Paint (3,6,7)	MS-5163-30	2	49.00			
GrafTalk (1,6,7)	RG-5065-1	3	499.00	RG-463-1	5	449.00
Z-Chart (1,5,7,9)				CB-463-11	3	49.00
4-Point Graphics (4,6,7)	IM-5063-1	3	195.00			
PROGRAMMING LANGUAGES						
BASIC-80 (5,8)				MS-253-1	3	175.00
COBOL (1,6,7)	MS-5063-3	5	395.00	MS-5063-3	5	395.00
C86 C Language Compiler (2,6,7)	CI-5063-1	3	395.00			
FORTRAN (2,6,7)	MS-5063-2	5	195.00	MS-5063-2	5	195.00
GW-BASIC 2 (5,7)	MS-5063-13	3	49.00			
GW-BASIC 2 (5,7)	MS-5163-13 (12,13,18)	3	100.00	MS-5163-13	3	100.00
MS BASIC-86				MS-463-1	5	175.00
Pascal (2,6,7)	MS-5063-5	5	295.00	MS-5063-5	5	295.00
Pascal/MT+ (1,6,8)				DR-253-5	5	99.00
GW-BASIC Compiler (5,7)	MS-5063-4	3	250.00			
Z-BASIC Compiler (5,7)				MS-463-4	3	250.00
SORTING						
Sort (1,6,7)	MS-5063-12	1	199.00	MS-5063-12	1	199.00
SuperSort (1,6,7)				MP-463-1	3	199.00
STATISTICAL ANALYSIS						
Microstat (1,6,7)	ES-5063-1	3	249.00	ES-5063-1	3	249.00

Minimum Computer Hardware and Software Requirements:

(1) 128K RAM
(2) 192K RAM
(3) 256K RAM
(4) 320K RAM
(5) One 5.25" disk drive
(6) Two 5.25" disk drives
(7) MS-DOS Operating System
(8) CP/M Operating System
(9) GW-BASIC Programming Language
(11) Z-204 Multiport I/O Card
(12) Z-319 Video Graphics Card
(13) MS-DOS Enhancement Op. Sys.
(14) Either Condor rDBMS or FMS and one Peachtree Accounting Package
(15) Version 2.5 Monitor ROM and a Z-205 Memory Card
(17) Z-304 Async Serial Port
(18) For H-100 Mode Operation
(20) Accesses 64K of RAM
(21) Z-BASIC Programming Language

*Condor is a registered trademark of Condor Computer Corporation. CP/M is a registered trademark of Digital Research Inc. Peachtree is a trademark of MSA, Inc. ZLAN is a trademark of Zenith Data Systems Corporation. Pascal/MT+ is a trademark of Digital Research Inc.

★Look for these new products.

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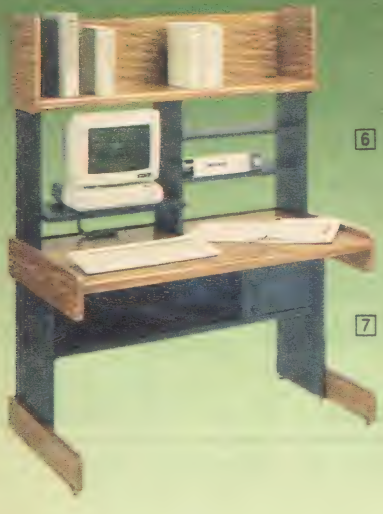

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6 Hutch for Large Desk

Add-on Hutch is 33" H x 45½" W x 11¾" D and securely fastens onto Large Desk. Its adjustable monitor shelf holds up to a 13" monitor. Has 11½" deep bookshelf and adjustable shelves.

PF-131, Shpg. wt. 46 lbs. **99.95**

7 Large Computer Desk

Spacious Desk measures 28" H x 45½" W x 29" D and features a lockable security cabinet for software. Has storage shelf beneath work surface, safety retainer on desk top, wire harness clip on back of desk, and adjustable floor levelers.

PF-130, Mtr. Frt. 85 lbs. **169.95**

8 Hutch for Computer Desk

Companion hutch to PF-125 Desk stands 28" high and 35¾" wide. It has a 9" deep full-length bookshelf with an electrical plug opening. An adjustable 20¾" wide by 10¾" deep monitor shelf can be positioned left or right of the desk. Also has two adjustable storage shelves.

PF-126, Shpg. wt. 33 lbs. **79.95**

9 Computer System Desk

Computer Desk offers a 35¾" W x 21" D work area, a back opening for printer paper, storage shelf, wire harness clips, floor levelers and stands 28" high.

PF-125, Shpg. wt. 51 lbs. **119.95**

10 Comfortable desk chair

Pneumatic seat with spring steel back rest.

PF-103, Shpg. wt. 20 lbs. **59.95**

11 Roll-Around Printer Stand

Versatile Stand measures 28" H x 28¼" W x 19" D and has full-length storage shelf with back opening.

PF-120, Shpg. wt. 35 lbs. **79.95**

12 Add-On Monitor Platform

Use with either Computer Desk or Printer Stand to hold 13" monitor. 6¼" H x 19" W x 11¾" D.

PF-132, Shpg. wt. 6 lbs. **17.95**

High-resolution monochrome and color video monitors, and an add-on 8-Inch Disk System

1 Build your own 12" diagonal monochrome monitor

SAVE $10.00

$79.95

- **Compatible with most personal computer systems**
- **Excellent character definition and intensity**
- **Displays either 40 or 80 characters per line**

Performance comparable with monitors costing much more and in a kit that's fun to build. A wide 15 MHz bandwidth and a fast 21 ns rise time (typical values) produces a noticeably improved character definition. Special DC-coupled circuits provide high screen brightness even with a screen full of characters.

An easy-to-read 25 lines containing 80 characters each are displayed on the 12-inch diagonal non-glare screen. A special 40-80 character switch accommodates computers whose video formats have a 40-column display output.

This popular kit monitor has a NTSC composite video input and a non-glare amber CRT. Front panel controls include black level, contrast, horizontal and vertical hold, and vertical height adjustments. Also has power on/off switch. Use this versatile monitor with the H/Z-100 Desktop and Personal Computers, the IBM-PC (with color board) and PC jr, Apple II and III, Compaq, Texas Instruments 99/4, and the Atari 800 and 1200 computers, or other computer with a composite output. Dimensions: 12" H x 12⅞" W x 12" D.

Kit HVM-122A, Shpg. wt. 22 lbs. ..... **Was $89.95 Now 79.95**

ZVM-121-1, IBM-PC Cable, (RCA connectors) Shpg. wt. 1 lb. **5.00**

ZVM-121-2, Atari 800 and 1200 Cable, Shpg. wt. 1 lb. **15.00**

2 Sharp graphics on 13" diagonal full color monitors

This RGBI-only color video monitor displays digital red, blue and true-green video signals with intensity input. It also supports the IBM brown. The monitor displays 25 lines by 80 characters and is designed to vividly show all your graphics presentations up to a 640 x 240 pixel area on a non-glare screen. Automatic color processing circuits always ensure clear and bright displays. Front panel controls include ON/OFF, Contrast and Brightness, and green LED power on indicator. Rear panel has Width, Focus, Height, and Vertical and Horizontal Centering. This monitor has a 9-pin D connector for directly connecting it to a PC video card such as the Z-309A. Dimensions: 14⅜" W x 12⅞" H x 15" D. Weight: 23 lbs.

ZVM-1330, Assembled, Shpg. wt. 31 lbs. **649.00**

All the features and capability of the ZVM-1330 plus the benefits of a long persistence CRT phosphor. The ZVM-1360 Monitor is also capable of displaying up to 640 x 480 pixels or 80 columns by 50 lines when driven by interlace video signals. Includes attached 9-pin D connector video cable.

ZVM-1360, Assembled, Shpg. wt. 34 lbs. **799.00**

ZVM-1300-1, Tilt Swivel Base for above monitors, 4 lbs. **30.00**

3 Special discount prices on 12" diagonal monitors

As low as

$119.95

- **For use with most popular personal computer systems**
- **Sharp and distinct character viewing of 25 lines x 80 characters on a "flat" face viewing screen**

Get super-sharp composite video displays when connecting any one of these three contemporarily designed video monitors to most any personal or home computer. Special DC-coupled circuitry permits the video display to retain its brightness even when the screen is full of information. Lightweight styling and fashionable shape permit these monitors to be easily carried and placed in almost any space for use in graphics or textual applications.

All three include a 100% modular chassis, compact cabinets, and a non-glare/dark tint glass screen for easier viewing. Conveniently located exterior controls include horizontal hold and width, vertical height, contrast, brightness, and power on/off. Front panel LED indicates power-on. All cabinets have dimensions of 10" H x 11¾" W x 12⅝" D and weigh 13 lbs.

Monochrome monitor with a non-glare amber screen. Monitor uses NTSC composite video input and has a 15 MHz bandwidth and 21 ns rise time (typical value) for noticeably improved character definition. Uses RCA phono plug cable to connect to Heathkit/Zenith Personal Computers, H/Z-100 Desktop, IBM Personal Computer, Osborne, Apple II and III, Compaq, TI, and others.

ZVM-1220A, Assembled, Shpg. wt. 16 lbs. .. **Regularly $199.00 Special 119.95**

Monochrome monitor with a non-glare green screen. Features all the advantages of the ZVM-1220A monitor with an alternative green phosphor CRT.

ZVM-1230A, Assembled, Shpg. wt. 16 lbs. .. **Regularly $199.00 Special 119.95**

TTL-compatible monochrome monitor for use with personal computers that provide monochrome video output signals. Has green CRT and 9-pin D-type video output connector. Features a micromesh antiglare filter for user viewing comfort. This antiglare filter reduces glare and enhances display contrast. Thus the displayed data and information is easier to read and can reduce user eye fatigue. This monitor has an 18 MHz bandwidth and 19 ns rise time for a first-class video display. For use with computers using the H/Z-329 High Resolution Card or IBM-type monochrome cards.

ZVM-1240, Assembled, Shpg. wt. 17 lbs. .. **Regularly $229.00 Special 169.95**

4 **ZVM-1200-1,** Tilt Swivel Base for use with above monitors, 2 lbs. **25.00**

5 Save $200 on a massive 2.5M byte storage system

Add extra data storage capacity to your H/Z-100 Desktop Computer with either one or two drive versions of the HS-207 8-Inch Disk System. Each drive uses soft-sectoring to store up to 1.26 MB on a single 8-inch double-sided double-density disk for a total of 2.52 MB of unformatted data storage. Disks are formatted in the industry-standard IBM 3740 style.

High performance and reliability are trademarks of this convenient way to greatly increase the data and information storage capacity of your computer. The drives used in this system have a speedy 90 millisecond average access time and a 3 millisecond track-to-track access time.

Factory-configured to operate with the H/Z-100 Computer, the HS-207 Disk System is ready to go by just connecting the flat 50-conductor command and information cable to the computer. Built-in power supply has line filter and uses 120 VAC. Dimensions: 13¾" W x 20½" D x 7¾" H.

Kit HS-207-41, One 8" drive system, 57 lbs. ..... **Was $999.00 Now 799.00**

Kit HS-207-42, Two 8" drive system, 69 lbs. ..... **Was $1599.00 Now 1399.00**

Z-207-41, Assembled Disk System with one 8" drive, 53 lbs. **1599.00**

Z-207-6, Assembled and tested second drive, Shpg. wt. 8 lbs. **699.00**

Be part of Heath/Zenith's worldwide Users' Group

Join with thousands of other Heath/Zenith computer users and keep up with the latest happenings and the newest Heath/Zenith computer products. With a HUG membership, you receive the informative REMark magazine every month for a year. It keeps you in touch with other members as you share hardware modifications, software improvements and ideas on computer topics through REMark's open forum. As a member you gain access to over 700 low-cost programs from HUG's software library. You can even purchase Heath/Zenith computer products at a discount using your HUG ID card. Get the latest on Heath/Zenith computer developments and HUG activities with a HUG membership, modem and a CompuServe time-sharing membership on the HUG Bulletin Board. Also participate in REMark's interactive forum with other members and use an online bulletin board via CompuServe. Get the most from your Heath/Zenith computer...join the Heath Users' Group. You'll find a HUG application enclosed with each Heath computer. And don't miss HUG's annual International Conference.

Send to: HUG Membership, Hilltop Road, St. Joseph, MI 49085.

Yes, I want to become a member of HUG and keep up to date on the latest Heath/Zenith computer developments, while I expand my software library.

I've enclosed $_____ (U.S. Funds only) to cover the cost of my membership. NOTE: No charge orders or billings are accepted.

Annual Rates:	U.S.	APO/FPO, all others
New Members:	$20	$35
Renewal:	$17	$30

202

Name _____

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Signature _____

Discover the fun of kitbuilding at your Heath/Zenith Computers & Electronics Center!

Your one-stop shopping center for Heath/Zenith and IBM-PC accessories and peripherals

For over 40 years Heath has built a reputation for providing you with quality products at very competitive prices. And we've backed them up with technical consulting help by telephone from the factory...plus local assistance at 63 Heath/Zenith Computers & Electronics Centers across the country.

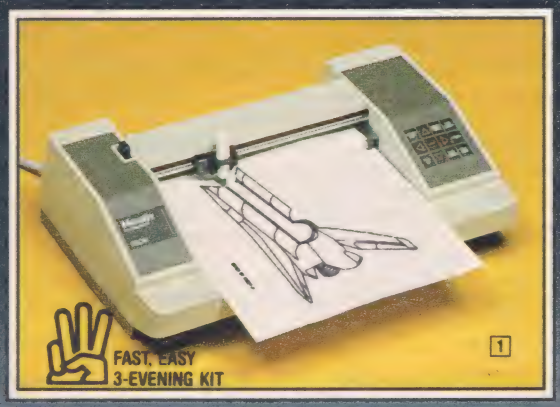
We're now extending the same philosophy to a special group of selected accessories and peripherals for the IBM-PC, all Heath/Zenith Personal Computers, the H-100 Desktop Computer, and the H-89 All-In-One Computer.

We've looked at hundreds of "compatible" items and selected those shown here on pages 98-100 as "best of breed." Functional checks and product tests have been performed on each item and our support team stands ready to provide information to you regarding installation and/or connection of any of these products to your IBM-PC or appropriate Heath/Zenith computer.

We'll even install any of the accessory boards on page 98 and 99 that you buy at a Heath/Zenith Computers & Electronics Center **FREE OF CHARGE** when you bring in your computer.

Even though covered by manufacturers' warranty, we're so confident you'll be satisfied with these products that we're offering a **90-day money back guarantee.** Either you're happy with the product or return it and we'll cheerfully refund your money.

Look for these special performance-guaranteed products on pages 98 to 100.



High-quality Epson Dot Matrix Printers

Epson's series of dot matrix printers are now part of the many quality products brought to you through your one-stop shopping center. They are the world's most popular printers with more business and computer enthusiasts all over the world using them more than any other kind.

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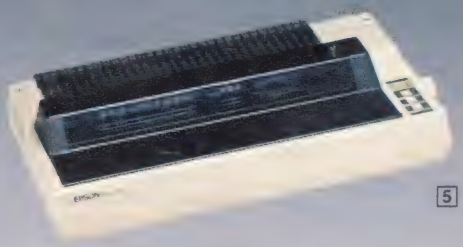
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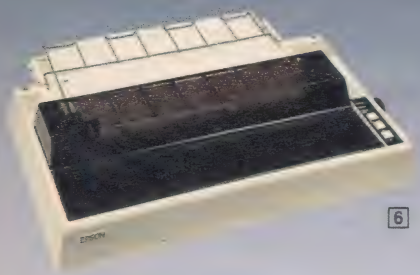
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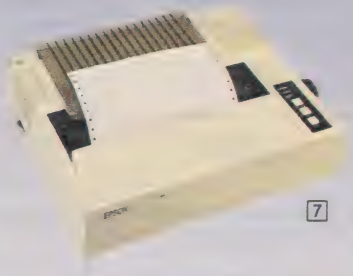
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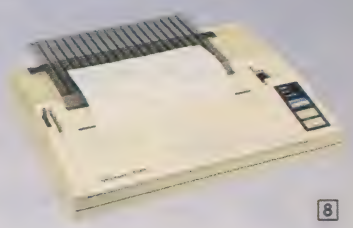
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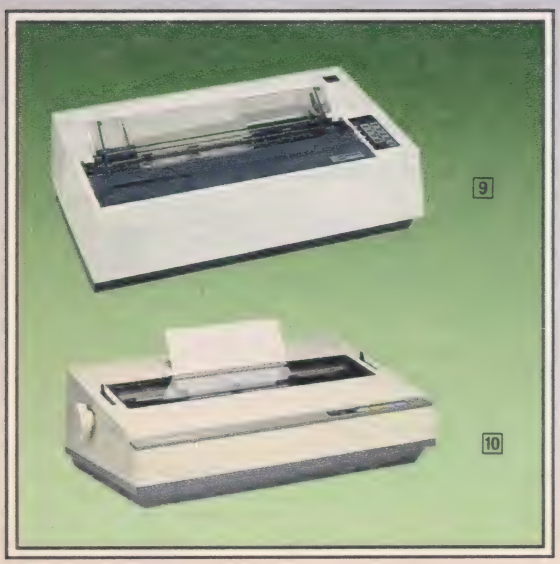


1 Plot high-quality graphics, charts and graphs

$229.95

- **Compact and lightweight plotter is fast, highly accurate, and very reliable**
- **Operates on simple commands from a computer**

Draw high resolution graphics with excellent line quality using the IR-5208 kit version of the popular Sweet-P Plotter. It draws virtually every graphic format you'll ever need including pie charts, bar graphs, straight and curved line graphs, illustrations, and alphanumeric labeling on plain bond paper or overhead transparency material. Line segments are accurate to four-thousandths (0.004) of an inch at a maximum speed of six inches per second.

Hook up the Plotter to the parallel port of a computer for colorful graphs and engineering graphics. Support Packs, listed below, include a parallel interface cable for use with the entire line of Heath/Zenith Computers as well as the IBM-PC and its compatibles. A software support package is also included with the cable. It is an easy-to-use tutorial that prompts you through each step to help you get the most out of your Plotter. Four pens (red, green, blue and black) are included in the Support Pack. The Plotter is compact (14" W x 8½" D x 3" H) and lightweight (7.2 lbs.) enough to be carried in a standard briefcase.

Kit IR-5208, Shpg. wt. 10 lbs. ..... **Was $299.95 Now Only 229.95**

IRA-5208-1, Support Pack for H/Z-100, Heath/Zenith Personal Computers, IBM-PC and IBM-PC compatible computers, Shpg. wt. 1 lb. **19.95**

IRA-5208-2, Support Pack for the H/Z-89 Computer (using CP/M* software) on hard-sectored 5.25" disk, requires Z-89-11 Multi-Mode Interface Board, Shpg. wt. 1 lb. **19.95**

IRA-5208-3, Replacement Pen Set includes 4 black pens, 1 lb. **9.95**

See our new line of Canon Personal Copiers on pages 10 and 11. They offer plain paper convenience at an affordable price with a unique interchangeable cartridge system. Plus they copy in color.

Get a popular EPSON Printer for any application

Features, graphics, and precision are qualities that have made Epson the leading printer manufacturer. Six popular Epson printers are available for uses that range from personal to business needs. Contact us today and see how we can fill your needs with an Epson printer. Choose from dot matrix printers that have pin-point correspondence, letter quality, or draft quality printing. You even have a choice of color. For value they cannot be matched.

All Epson printers feature bidirectional printing using a logic seeking printhead. All printheads are disposable (except for the LQ-1500) and most have a built-in 2K RAM buffer. All have programmable line spacing, page length, column width, and skip over perf. All these printers have parallel interfaces (choice of optional serial or parallel port on LQ-1500) and all feature Epson's special Quiet Mode for quieter office or home environment operation.

For our latest prices contact your local Heath/Zenith Computers & Electronics Center. You'll find it listed in the telephone book white pages.

2 **PP-240,** LQ-1500 draft and letter quality printer. Shpg. wt. 36 lbs.

PPA-240-1, Replacement ribbon for LQ-1500 Printer. Shpg. wt. 1 lb.

PPA-240-3, Serial Port for LQ-1500 Printer. Shpg. wt. 2 lbs.

PPA-240-4, Parallel Port for LQ-1500 Printer. Shpg. wt. 2 lbs.

3 **PP-243,** LQ-1000 letter quality printer. Shpg. wt. 36 lbs.

4 **PP-246,** LQ-800 letter quality printer. Shpg. wt. 36 lbs.

5 **PP-236,** FX-286 136 column business printer. Shpg. wt. 32 lbs.

6 **PP-230,** RX-100 136 column standard printer. Shpg. wt. 27 lbs.

PPA-230-1, Replacement ribbon for RX-100/FX-100/FX-185. Shpg. wt. 2 lbs.

7 **PP-225,** FX-85 bidirectional printer. Shpg. wt. 21 lbs.

PPA-225-1, Replacement ribbon for FX-80/FX-85. Shpg. wt. 1 lb.

8 **PP-220,** LX-80 draft and near letter quality printer. Shpg. wt. 15 lbs.

PPA-220-1, Replacement ribbon for LX-80. Shpg. wt. 1 lb.

PPA-220-2, Tractor feed for LX-80. Shpg. wt. 2 lbs.

PP-205, An optional serial port with 2K buffer for all EPSON LX, FX, RX, and JX series printers. Shpg. wt. 1 lb.

9 High-speed Primage 90 daisy wheel printer

Very quietly print out documents at up to 90 characters per second with this high-speed daisy wheel printer. It prints at pitches of 10, 12, and 15 cpi, and proportional spacing. It is bidirectional and offers horizontal spacing in increments of 1/120" and vertical spacing at 1/96." The Primage 90 can handle single sheets or an original plus up to 5 carbon copies.

Connect to virtually any mini- or micro-computer through a serial RS-232 or Centronics parallel interface port. No special cables or adapters needed. Select baud rates from 110 to 9600. The printer emulates the Diablo 630 command set including word processing functions. Printer comes with a 2K storage buffer.

PP-251, Assembled and tested, Shpg. wt. 63 lbs. **1299.00**

PPA-250-1, Cut-Sheet Feeder, Shpg. wt. 18 lbs. **299.95**

PPA-250-2, Tractor Feeder, Shpg. wt. 6 lbs. **275.00**

10 Low cost Panasonic Daisy Wheel Printer

High performance, reliability, and versatility are offered by this printer that features outstanding print quality with fully formed characters. This Panasonic KX-P3151 Daisy Wheel Printer prints out at 22 characters per second using word processing bold, shadow, underline, justification, and centering functions. It can handle paper up to 15½" wide with a capacity of an original plus 3 copies and 3 carbons. Printing is done bidirectionally with a logic seeking head at pitches of 10, 12, 15 cpi and proportional spacing.

Other features include a standard Centronics parallel interface to connect to most popular computers. A 7K storage buffer is also standard on this compactly designed printer. Uses a convenient no-mess cassette ribbon cartridge.

PP-261, Assembled, Shpg. wt. 35 lbs. **599.00**

11 Hayes Automatic 300 baud Smart modem

Automatically dial, answer, send, receive, and disconnect calls. Use with rotary or TOUCH-TONE phone systems. Has RS-232 and includes 120 VAC adapter and phone cable. Built-in audio speaker allows listening in on phone connection. Requires HCA-11 cable on page 97 and CPS software.

WH-43, Assembled and tested, Shpg. wt. 3 lbs. **279.00**

12 New 2400 baud modem for faster communications

Lower phone costs by cutting valuable hours off your telecommunications times and increase your productivity with the Courier 2400 from U.S. Robotics. Upload or download data at twice the speed of a 1200 baud modem as this high-speed modem transmits at 240 characters a second. It features auto-dial and auto-answer and is fully CCITT and Bell compatible.

Use any of the popular telecom software packages as this modem responds to the full AT command set. For your convenience, this entire set, along with S-register functions, can be displayed on detailed help screens. All of the different dialing commands are also available on-screen. This 2400 baud modem lets you know the length of each call and displays on-screen the status of a call in progress. A speaker with audio level control provides phone line monitoring.

Automatic baud rate switching is a real plus with this modem. Without user intervention the modem can switch baud rates (300, 1200, and 2400) in either the originate or answer mode. And it can test itself in both modes as well.

PP-320, Assembled and tested, Shpg. wt. 5 lbs. **649.95**

13 Convenient, low-cost acoustic modem

The LEX-11 operates at 300 baud in half or full duplex. Has RS-232 connector. Includes AC adapter. Requires an HCA-11 cable on page 101 and CPS software.

WH-23, Assembled, Shpg. wt. 3 lbs. **119.00**

14 US Robotics 1200 Baud Auto-Answer Modem

Features full and half duplex operation, direct connection to RJ11C standard phone jack, auto and manual answer and originate modes. Includes cable.

PP-300F, Shpg. wt. 3 lbs. ..... **Only 299.00**

Astonishing communications power with HYPERACCESS

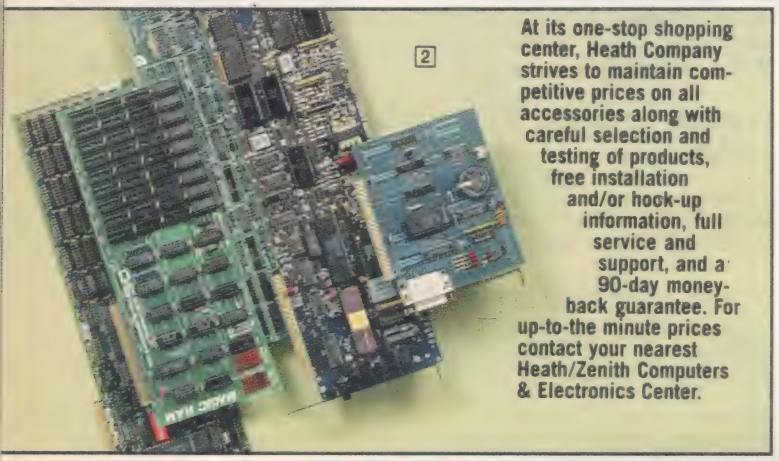
The smoothest, easiest path to all your computer communications needs. This software uses a startup program that sets up everything for you. An on-screen tutorial lets you use program features. Easy to use menus let you do your work instead of program the computer. Use with virtually any modem even 2400 baud type. Emulate various terminals or operate your computer from a remote station. Use with other programs or use DOS within this program. Runs on Heath/Zenith Personal Computers, IBM-PC and compatibles.

NEW! PM-160, HYPERACCESS software, Shpg. wt. 3 lbs. **149.00**

Additional accessories are on page 101.

*CP/M is a trademark of Digital Research, Inc.

1



2

At its one-stop shopping center, Heath Company strives to maintain competitive prices on all accessories along with careful selection and testing of products, free installation and/or hook-up information, full service and support, and a 90-day money-back guarantee. For up-to-the minute prices contact your nearest Heath/Zenith Computers & Electronics Center.

3

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Guaranteed money-back accessories for the

1 Ten megabyte disk storage from IOMEGA

Selected as an outstanding product of 1984 by PC Magazine, the Bernoulli Box from IOMEGA Corp. may well put the Winchester drive on the back shelf. Offering the hard disk capacity and speed of a Winchester plus the economy and convenience of flexible disks, the Bernoulli Box is the answer to more reliable, versatile and economical data storage. Each 8½" by 11" removable cartridge houses a flexible disk that stores ten megabytes of data. And, it doesn't require special handling as does familiar 5.25" and 8" floppy disks.

The unique Bernoulli Box combines a number of technological breakthroughs that result in a storage system of amazing simplicity. Data and mechanical reliability is unmatched and the cost per megabyte of storage is dramatically low. The Bernoulli Box complements Heath/Zenith Personal and Portable Computers, as well as the IBM PC and all its compatibles. With this extraordinary storage system you can exceed the capacity of hard disk drives and get transfer and access time that are faster than most Winchester drives. And, it features full support of the MS-DOS operating system.

Available in two versions for use with Heath/Zenith Personal Computers, the IBM PC and compatibles including the IBM PC AT compatible, the H/Z-241 Advanced PC. A single drive version offers 10 megabytes of data storage while a second two-drive configuration provides up to a massive 20 megabytes of online information storage. Either arrangement requires a controller board which is listed below. Each Bournolli Box includes software, cable and one high-capacity cartridge per drive. IOMEGA'a Bernoulli Box supplies more storage...more reliable storage, more versatile storage, more economical storage. And more storage applications – primary, back-up, archival – all in one package.

PP-510, Single drive 10 MB storage, Shpg. wt. 29 lbs. **1999.00**
PP-511, Dual drive 20 MB storage, Shpg. wt. 43 lbs. **2799.00**
PP-501, Controller Board, Shpg. wt. 2 lbs. **159.95**
PPA-500-2, Tri-Pak blank 8" cartridges, Shpg. wt. 5 lbs. **199.95**
PPA-500-3, Head Cleaner Kit, Shpg. wt. 3 lbs. **79.95**

2 Guaranteed accessory cards that plug right in

Expand the capabilities of your Heath/Zenith or IBM PC Computer with these "best-of-breed" plug-in accessory boards. All are Heath checked for quality and high reliability. Take advantage of all that Heath offers.

NEW! Fully loaded 1200/300 baud internal modem

The latest integrated modem technology and advanced computerized assembly methods are used to cram the most power and flexibility possible into the ZOOM/MODEM PC 1200. The PC 1200 features almost totally automatic operation, including auto-dial, auto-answer/originate, auto-test, automatic speed selection, and speaker volume control.

Fast and more reliable dialing. The PC 1200 actually hears dial tones, busy and ring signals, MCI and Sprint tones, and even someone answering a phone using progress tone detection. This results in more reliable dialing than modems featuring a plain "pause." The PC 1200 even reaches busy phone numbers automatically with its rapid-fire DEMON DIALER capability.

A special TOUCHTONE detector gives you extra security from caller break-ins. The PC 1200 waits for a password before it sends a carrier tone, unlike the HAYES modem. When the password is given, only then does the PC 1200 send out a carrier so that intruders don't know a modem is on line.

On-board are many extras that are options on other modems. The PC 1200 comes with a system clock that allows date and time stamping of all files. The clock is backed up by an extra long life lithium battery. The PC 1200 has an 8K byte RAM buffer for use in background electronic messaging. Have your modem auto-answer the phone and collect incoming messages in the background while you are working with some other applications software in the foreground.

Unlike other modems, the PC 1200 has an open architecture that enables modern firmware upgrade or customization at any time. It is configurable for COM 1,2,3 or 4 for maximum flexibility in adding serial peripherals. And the PC 1200 has an audio input jack for use with a voice synthesizer output over your phone line.

Communications software on disk is included with the modem and supports all the features of the ZOOM modem. The easy-to-use menu-driven communications program allows auto-dialing with tone detection and DEMON DIALING, electronic mail, tone passwords, audio input, disk storage and clock control.

The PC 1200 is compatible with all Heath/Zenith PCs, IBM PCs and their compatibles, as well as the fastest PC-AT or compatible. And this modem is 100% compatible with the Hayes SMARTMODEM, both hardware and software. The PC 1200 can be used with 1A2 type office key systems and includes instructions and installation guidelines for all common office phone systems. The PC 1200 comes complete with phone cord, bracket and card guide. FCC Approved.

PC-132, Assembled ZOOM/MODEM PC 1200, Shpg. wt. 3 lbs. **349.95**

entire line of Heathkit/Zenith Computers, the IBM PC, and IBM PC compatibles

NEW! Intel Above Board expands computer memory

Add up to 2 megabytes of extra memory to your computer system. Let your spreadsheets or database grow without having to split them up because 640K of RAM just isn't enough memory for your applications. This configuration of Intel's Above Board works with Lotus 1-2-3, SYMPHONY, FRAMEWORK, and other programs without letting you worry about "Memory Full" errors.

The first memory board of its kind, the Above Board uses the unique Lotus-Intel Expanded Memory System, the emerging standard for memory over 640K. Really two memory boards in one the Above Board can be used to fill in conventional memory below 640K or expand workspace memory above 640K as your needs expand. The Above Board includes a print buffer, RAMdisk and menu-driven installation programs. Fits in one slot of Heath/Zenith or IBM PC.

PC-146, Assembled, Shpg. wt. 3 lbs. **395.00**

$AVER Get a big 50% discount on extra 256K of RAM

Purchase extra Z-205-4 256K RAM Chip Sets within 90 days of a PC-146 Intel accessory board and receive half off the regular price.

Z-205-4, Shpg. wt. 1 lb. ..... **Regularly $199.00 Discount Price 99.50**

High resolution monochrome/color multifunction board

The Graphics Master Board from Tecmar supplies Heath/Zenith Personal and Portable Computers, and IBM-PC computers with high resolution color (640 x 400 in 16 colors) and monochrome (720 x 700) graphics capability. Provide yourself with a wider choice of monitors including RGB, NTSC composite, and IBM monochrome compatibles. External sync is provided for use with a video mixer to allow overlaying characters or other computer-generated images on a video picture. Has 128K of on-board memory. Is compatible with LOTUS 1-2-3, GrafTalk and other software.

TE-37, Assembled Graphics Master Board, Shpg. wt. 3 lbs. **545.00**

Add joystick capability with DG Analog Game Port

Plug-in Analog Game Port allows the addition and use of joysticks and graphic pads (such as WICO and KOALAPAD) and other analog devices. Includes clock/calendar and long-life battery to maintain clock operation during periods when the computer is turned off plus software for displaying time on-screen. Supported by GW-BASIC. For use with the Heath/Zenith and IBM PCs.

PCS-110, Assembled, Shpg. wt. 1 lb. **119.95**

On-line time and date for the H/Z-100 Desktop Computer

An add-in circuit card for the H/Z-100 Desktop Computer, ZCLK from FBE Research Company, Inc. that provides the time in a 24-hour format to the second and a calendar in a numerical month, date, year format. This circuit card installs very simply on the motherboard and doesn't require an S-100 expansion slot.

A long-life lithium battery maintains the time and date during power off periods. MS-DOS software is included to set and read the time and date and to automatically set the operating system time and date at bootup. This software also makes Daylight Savings Time adjustments on command.

PC-240, Assembled ZCLK Board, Shpg. wt. 1 lb. ..... **Last Call 119.95**

Save on discounted US Robotics Auto Dial Modem Card

This modem fits into an H/Z-100 Computer expansion slot and connects directly to a phone line through a standard RJ11C modular phone jack. It can transmit and receive data at rate of 1200 baud or at a slower 300 baud rate. It is Bell 212A/103 compatible. This auto dial modem also features auto answer, manual answer and manual originate modes of operation. All modem functions are controlled by commands (Hayes type programming commands) sent to the modem through the same channel as the data is transmitted and therefore doesn't require extensive software support. Includes a phone cord.

The optional TELPAC communications software for use with the U.S. Robotics modem lets you use modern commands to call any other data system. The software is easy to use and flexible enough to be used in many ways with different types of hardware. Requires MS-DOS and 128K of RAM.

PC-200, Assembled, 2 lbs. ..... **Was $399.00 Limited Quantity At 349.95**

PA-100-1, US Robotics TELPAC Software, use with the MS-DOS operating system. Shpg. wt. 21 lbs. ..... **Was $99.00 Now Only 79.95**

Versatile tools for computer and electronics hobbyists

Move into the growing field of programming EPROMs with two inexpensive Heathkit tools, the ID-4801 EPROM Programmer and the ID-4803 EPROM Eraser.

Use the EPROM Programmer to ROM-base your software. The ID-4801 makes it easy to load and verify programs into many popular EPROMs. Or use it to duplicate or simulate ROMs in external devices.

The Heathkit EPROM Eraser helps you cut down on ultraviolet erasable read only memory device costs by letting you use them over and over. The Eraser is easy to use and takes up little room on your work bench.

See pages 56 and 57 for more information on these exciting tools.

3 Turn a knob instead of switching cables

A real convenience and it can save on additional costly equipment. This two position RS-232 switch allows you to share printers, modems, computers, terminals, or any RS-232 device. Just turn the front panel knob and any device, such as a printer, can be switched to either of two computers. No more lost time in connecting and disconnecting cables, or running the danger of bent connector pins while you're hurriedly swapping cables. A simple knob turn and the cable reconnection is complete, safely and quickly.

Twenty-four signal lines on the interface are switched when the knob is turned and all are transparent to data speeds and code types. This unit can also be used with IBM-type parallel cables. Make shared equipment a lot easier to use with this compact 3¼" H x 6" W x 6¼" D transfer switch. All connectors are female.

PM-120, Assembled RS-232 Switch, Shpg. wt. 1 lb. **89.95**

4 Kit breakout box checks RS-232 interfacing

Take the guesswork out of RS-232 interfacing problems with this versatile breakout box. With it you can check all 25 lines of a computer system's interface circuitry. And switch disabling of 23 lines enables you to isolate lines and then cross-connect them to track down hard-to-find problems. LED indicators monitor 12 key circuit lines for a quick indication of line activity. Two flat cables connect the Breakout Box between any 25-pin D connectors on computers, printers, modems, etc. Each cable end has both DTE and DCE connectors for any male/female connector situation. Five jumper wires are provided. Requires two "AA" batteries. Dimensions: 1⅜" H x 2⅛" W x 6" D.

Kit PMK-130, Shpg. wt. 2 lbs. **89.95**

5 Breakout Box RS-232 Terminal Interface Tester

Isolate problems within a computer system with this pocket sized, self-contained tester. Connect it between equipment and communication lines to monitor 12 different signals. LEDs signal line condition. Interface pins can be cross-patched with the tester's connection jumpers to test and correct problems. Twenty-four in-line switches allow interrupting any interface signal.

WH-15, Assembled RS-232 Breakout Box, Shpg. wt. 1 lb. **159.00**

6 Smart Outlet Box with increased protection

- **Automatic single switch control of up to six other AC outlets**

The GD-1495 Smart Outlet Box combines fast response to and suppression of pulse, surge, and lightning induced voltages along with automatic AC control of up to six other components. This device has eight AC (3-prong type) outlets. Six are controlled by a sense socket and the eighth is a constant AC outlet for a device such as a clock that you do not wish to turn off.

Plug the AC cord of a conveniently located component into the labelled control socket. Anytime you turn on this device, current flow is sensed and AC power is automatically switched to any equipment plugged into the six switched outlets of the Smart Outlet Box. This allows you to power up a number of devices such as a printer, modem, external drives, etc. using your computer's power switch. The control socket even allows a small amount of current to pass through it for equipment containing digital clocks. This multi-outlet surge suppressor has dimensions of 14¼" x 2¼" x 2¾" and weighs 2.8 lbs.

Kit GD-1495, Shpg. wt. 5 lbs. **59.95**

GDW-1495, Assembled Smart Outlet Box, Shpg. wt. 4 lbs. **99.95**

Peripherals and accessories for Heathkit/Zenith

1 Fastest-switching backup power for computers

1000 VA Standby Power System from Safe uses all-new detection and a solid state transfer switch to make it the fastest power switching supply at one millisecond or less. This backup power system provides a clean sine wave output (required for IBM XT and AT computers) that is both voltage regulated and current limited. And it is synchronized to the line for proper operation of all phase controlled devices. Switchover takes place anytime the AC voltage drops below 108 volts. Run time at half load is 18 minutes. Eliminate the effects of 98% of all AC power related problems with this protective standby power system.

Further protection is added with built-in surge suppressors, over-current protection, voltage regulation, and built-in EMI/RFI filters. This standby power supply will even protect itself from damage due to overloading. Its dimensions are 19" L x 8" W x 13" H and weighs 69 pounds.

PP-120, Assembled, Shpg. wt. 78 lbs. Mtr. Frt. **1195.00**

2 Protect your computer's data and memory

Provide emergency power for your personal or business computer with the 400 VA Standby Power System from Safe Electronics Systems. Eliminate the headaches, lost time, and the expense of lost data caused by an unexpected loss of power or a brownout. As soon as the power drops, this power protection system turns on in less than one-half cycle to protect data stored within your computer. Up to ten minutes of standby power is provided with a full load (24 minutes under half load) to give an operator plenty of time to save data and files and then shut down the computer safely. During normal operation this standby power supply acts as a line filter to protect against harmful power line spikes. This power protection system has dimensions of 12⅝" L x 10¾" W x 6" H, has four AC power outlets and operates from 110 VAC at 60 Hz.

PP-115, Assembled, Shpg. wt. 39 lbs. **549.95**

Data-saving 200 VA Standby Power Protection System

In less than one-half cycle this Standby Power System from Safe Electronics will switch 200 VA of power to your computer equipment whenever the AC line voltage drops below 108 volts. Power will last for a minimum of 20 minutes...time enough to save all your computer data and to safely power down.

This system will provide power during blackouts or brownouts to personal and small business computers, or any device that needs up to 200 VA of emergency power. During normal operation this power system acts like a line filter to protect your equipment from harmful power line surges and voltage spikes. When the line voltage drops, the system turns on to protect data and memory in your computer until you can safely exit your software and power down your computer system.

This 200 VA Standby Power System has two AC outlets for equipment that you want and need to be protected. Its dimensions are 12⅝" L x 10¾ D x 6" H. Alarm features include an indicator lamp and buzzer. Surge protection provided.

PP-111, Assembled, Shpg. wt. 34 lbs. **349.95**

3 Reduced prices on KoalaPad Tablet and software

Just a touch of your finger can control Heath/Zenith Personal or Portable Computers, or the IBM-PC computer. Software included with pad enables you to draw and color pictures on a color monitor screen by simply moving your finger or a stylus (included) across the 4" x 4" touch-sensitive surface of the KoalaPad. Or, write your own application programs using GW-BASIC's built-in commands. GW-BASIC version 2.0 is required to use all the features of PC Design software included with the pad. Requires PCS-110 (or similar) Analog Game Card on page 98.

PP-400, Assembled, 3 lbs. ..... **Was $99.95 Limited Quantity At 89.95**

PPA-400-1, SPEED KEY software turns pad into combination mouse and 37 programmable softkeys. Includes overlays for BASIC, dBASE II, LOTUS 1-2-3, Multiplan, WordStar, and others, or program your own softkeys. Rated by INFOWORLD as excellent in performance, documentation, ease of use, and error handling. Speed Key replaces multiple keystrokes required by most software with a single pushbutton command. With Speed Key you can create your own custom overlays to reduce repetitive computer commands.

Shpg. wt. 2 lbs. ..... **Was $59.95 Limited Quantity At 34.95**

4 New! Ultra-responsive and lightning fast joystick

Blow away the competition with this responsive state-of-the-art Gravis MK VI Analog Controller. The full-sized, metal-reinforced padded handle on this controller has an integrated firing button for rapid thumb firing during arcade type games. An eight-level handle spring tension adjustment allows you to set the response of the handle from free floating to a very strong and very tight center. Also has two additional and programmable fire buttons, trim adjusts, and extra long 72-inch cable. Requires PCS-110 (page 98) or other analog game port.

PP-402, For use with Heath/Zenith PCs, Assembled, 2 lbs. **39.95**

PP-450, For use with Apple IIe and IIc, Assembled, 2 lbs. **39.95**

5 Smart Interface Cable connects all RS-232 devices

An intelligent interface cable, Smart Cable looks at the RS-232 signals from the computer and the peripheral and uses its own logic circuitry to match up all data, handshake, and control lines automatically. All you do is plug in the cable and set two switches. The computer can be any make or model and the peripheral can be any RS-232 serial device. Any word length or code format used in transmission is acceptable and any baud rate up to 19,200 can be used. Has built-in male and female connectors and derives its power from the lines through current summing functions. Always have the right cable at hand and be able to hook up your computer to virtually any peripheral.

PP-100, Assembled, Shpg. wt. 1 lb. **79.95**

Computers, and IBM-PC computers and their compatibles

High quality personal computer supplies and accessory support for your computer system

Do your shopping at our one-stop computer center where you can get everything you need for your computer system. Every accessory and support product is selected with your satisfaction in mind. Whether it's cables, printer paper, floppy disks, or cleaning materials, you'll be satisfied with the quality of the product and the way they make your work go faster and easier.

Pre-wired cables for connecting peripherals to your Heath/Zenith or IBM PC computer

RS-232 Male-to-Male Cable, 10 feet long (connects pins 1-8,20).
HCA-10, Shpg. wt. 1 lb. **20.00**

RS-232 Male-to-Female Cable, 10 feet long (connects pins 1-8,20).
HCA-11, Shpg. wt. 1 lb. **20.00**

RS-232 Female-to-Female Cable, 10 feet long (connects pins 1-8,20).
HCA-12, Shpg. wt. 1 lb. **20.00**

PC Male-to-Female Cable, 6 foot cable for Heath/Zenith and IBM PCs.
HCA-51, Shpg. wt. 1 lb. **30.00**

PC Female-to-Female Cable, 6 foot cable for Heath/Zenith and IBM PCs.
HCA-52, Shpg. wt. 1 lb. **30.00**

PC Parallel Cable, 10 foot cable for Heath/Zenith and IBM PCs.
HCA-53, Shpg. wt. 2 lbs. **30.00**

PC Serial Conversion Cable, 1 foot cable for Heath/Zenith and IBM PCs.
HCA-100 PC, Shpg. wt. 1 lb. **16.00**

WH-64 Parallel Cable, 10 foot cable for use with TI 855 Dual Mode Printer.
HCA-22, Shpg. wt. 1 lb. **35.00**

WH-64 Serial Cable, 10 foot cable for use with TI 855 Dual Mode Printer.
HCA-24, Shpg. wt. 1 lb. **35.00**

Consistently dependable 5.25-inch and 8-inch floppy disks that will perform to your satisfaction

5.25" soft-sectored, double-sided, quad-density, floppy disks for use only with the Heath/Zenith Advanced (AT) PC, the IBM PC AT and other AT compatibles. Stores up to 1.2 megabytes of data on a single disk. Package of ten.
HCS-60, Shpg. wt. 1 lb. **59.00**

5.25" hard-sectored, single-sided, single-density floppy disks used with 48 TPI disk drives (H-17-1) and the H-88-1 Controller Board to store up to 100 kilobytes of data on a single disk. Package of ten.
HCS-70, Shpg. wt. 1 lb. **40.00**

5.25" soft-sectored, double-sided, double-density floppy disks for use in all Heath/Zenith Personal Computers and the H/Z-100 Advanced Computer. Stores up to 320 kilobytes of data. Also for use with Heath/Zenith computers equipped with H-17-5 drives and the Z-89-37 Controller Card. Package of ten.
HCS-71, Shpg. wt. 1 lb. **50.00**

5.25" soft-sectored, 96 TPI, double-sided, double-density floppy disks for use with H-17-5 disk drives and Z-98-37 Controller Board for storing up to 640K bytes of data on a single floppy disk. Package of ten.
HCS-68, Shpg. wt. 1 lb. **55.00**

8" soft-sectored, single-sided, single-density floppy disks formatted in the IBM 3740 style with up to 250K bytes of storage capacity. Package of ten.
HCS-69, Shpg. wt. 2 lbs. **55.00**

Quality paper to make small or large printing jobs easier to handle at an economical price

Premium correspondence-quality 8.5" x 11" paper. One-part fan-fold paper is a continuous 2700 sheets long and is edge-punched.
HCS-1, Shpg. wt. 28 lbs. **32.00**

Standard 8.5" x 11" paper. One-part fan-fold paper is a continuous 3200 sheets and is edge-punched.
HCS-2, Shpg. wt. 31 lbs. **32.00**

Standard 14.875" x 11" paper. This one-part fan-fold paper is continuous 3200 sheets long and is edge-punched.
HCS-3, Shpg. wt. 47 lbs. **42.00**

Bond 8.5" x 11" form-feed paper. This top-quality fan-fold paper is a continuous 1000 sheets long and is edge-punched.
HCS-4, Shpg. wt. 13 lbs. **25.00**

Protection and quick access in a convenient floppy disk organizer that uses very little desk space

Data Defender form Ring King holds up to seventy 5.25" floppy disks in a charcoal-colored copolymer plastic case. A locked hinged lid protects your disks from unauthorized access. It comes complete with rigid dividers that can be placed where you want so you can make sections larger or smaller as desired. Index tabs are included for easy section identification. Built-in handles add carrying convenience.
PM-100, Shpg. wt. 3 lbs. **24.95**

Quickly and easily reduce damaging static buildup while keeping your computer equipment clean

STAT-ATTACK Computer Cleaning System includes everything you need. The system contains: inert dusting gas to spray dust and loose dirt away from computer equipment; antistatic spray to protect your computer from static charges; monitor screen and keyboard cleaner to remove all types of dirt and grime from most surfaces; antistatic cabinet cleaner, combines cleaner and static fighter; greaseless antistatic hand lotion helps eliminate static discharges between the body and sensitive equipment; and lint-free wipers and swabs to remove dirt and help keep equipment clean.
PM-111, Shpg. wt. 2 lbs. **24.95**

Dark, crisp print with long-life printer ribbons

Primage 90 and Diablo 1640/630 daisy wheel printer plug-in ribbon cartridges. A package of three film ribbons.
HCS-51, Shpg. wt. 1 lb. **18.00**

WH-64 Texas Instrument 855 Dual Mode dot matrix printer. One no-mess plug-in ribbon cartridge.
HCS-57, Shpg. wt. 1 lb. **12.00**

MPI Printer accessory cable and applications packages for printing anything you can display on-screen

Parallel Cable for interconnecting either an MPI-150 or an MPI-99 Printer to Heath/Zenith Personal Computers.
MPA-10, Shpg. wt. 1 lb. **35.00**

H/Z-100 AP-PAK is a graphics application package that enables the MPI-150 Printer to print out any H/Z-100 Computer graphics character, large displays, and decorative fonts. Do more for your printouts and go beyond ordinary looking reports. Choose from over 60 different type styles or create your own special fonts...even your own logo. Includes interconnecting cable. Some features require the use of the GW-BASIC programming language.
MPA-1, Shpg. wt. 1 lb. **75.00**

H/Z-89 AP-PAK is a graphics application package that enables the MPI-150 Printer to print out any H/Z-89 Computer graphics character, large displays, and decorative fonts. Do more for your printouts and go beyond ordinary looking reports. Choose from over 60 different type styles or create your own special fonts...even your own logo. Includes interconnecting cable. Some features require the use of the MBASIC programming language.
MPA-3, Shpg. wt. 1 lb. **75.00**

H/Z-90 AP-PAK is graphics application package that enables the MPI-150 Printer to print out any Z-90 Computer graphics character, large displays, and decorative fonts. Do more for your printouts and go beyond ordinary looking reports. Choose from over 60 different type styles or create your own special fonts...even your own logo. Includes interconnecting cable. Some features require the use of the MBASIC programming language.
MPA-4, Shpg. wt. 1 lb. **75.00**

Printwheels for the Primage 90 daisy wheel printer

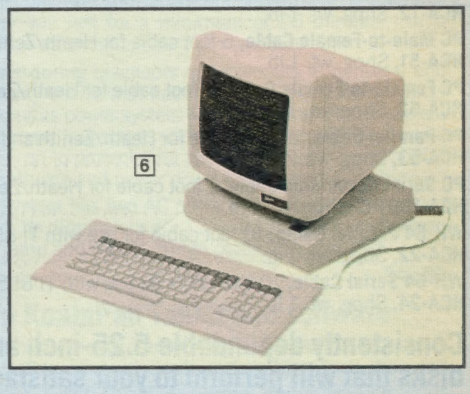
Courier 10 printwheel with 10 characters per inch spacing.
PPA-250-4, Shpg. wt. 1 lb. **19.95**

Prestige Elite printwheel with 12 characters per inch spacing.
PPA-250-5, Shpg. wt. 1 lb. **19.95**

Versa-Tile PS printwheel with proportional spacing.
PPA-250-6, Shpg. wt. 1 lb. **19.95**

Tile 10/12 printwheel with dual 10 or 12 characters per inch spacing.
PPA-250-7, Shpg. wt. 1 lb. **29.95**

Top performing terminals that feature versatility, compatibility, economy, and ease of use



1 New terminal satisfies personal and business needs

Save $150

$599.00

- **Built-in flexibility and ease of operation make this terminal one of the most versatile available**
- **Four modes emulate popular business terminals**

The Z-39 Terminal is an ideal workstation for data or order entry, information retrieval, electronic mail, and clerical word processing. It represents a low-cost, high-performance answer to both your personal and business needs with professional features designed into a comfortable, human-engineered package.

Designed with the user in mind, the Z-39 features a professional 12-inch diagonal non-glare screen that helps increase productivity by relieving eye-strain caused by long periods of use. The green screen displays 24 lines of 80 characters each plus a 25th status line for terminal information or programmed for notes or reminders by the user. The large 8 x 10 dot matrix that makes up each character on the screen provides sharp and clear alphanumeric displays.

The low-profile keyboard is detached to let you freely move it around for maximum operator comfort. It is laid out in a standard QWERTY keyboard style for easy use by touch typists. The keyboard generates all the codes for upper and lower case letters, numbers, and punctuation plus subscripts, super-scripts, scientific notation and graphics characters. Dedicated function keys speed terminal operation while special function keys can be used for special purposes through software, or may be user-defined. A separate calculator style keypad makes rapid entry of numbers very easy for accountants and spreadsheet users.

Built-in editing commands permit fast, simple manipulation of text and data entry. Basic word processing edit and erase functions include insert or delete a character or line; erase a page, a line, to end of a line, to the beginning of a line, to the beginning of a page, and to the end of a page. In addition, select visual attributes like blinking to call attention to a certain condition, reverse video or half-intensity to distinguish between different types of data, or blanking to inhibit the display until a password is given.

All terminal features are keyboard accessible and can be stored in nonvolatile memory to remain until you change them. Among the accessible features are video attributes, status line, key click, keypad select, port assignment, tabs, test, handshaking, and others. One of these is the screen saver which increases the life of the screen by blanking it after a period of inactivity. Another is terminal emulation selection of ANSI, Lear Siegler ADM3A, Hazeltine 1500 or Zenith terminals. And you can select a baud rate for transferring data from a slow 75 baud to transferring a screenful of characters in 1 second with a baud rate of 19200, better performance at lower phone line charges.

Other features include a tilt and swivel video display with a front mounted power switch, DCE and DTE RS-232C connectors, set mode, function indicators, automatic internal self checks, and a power-on indicator.

Zenith data systems **Z-39,** Assembled, 36 lbs. ..... **Was $749.00 Now Only 599.00**

Z-39 SPECIFICATIONS: VIDEO DISPLAY: CRT: 12" diagonal, green phosphor, non-glare display. **Display Format:** 25 rows of 80 characters. **Display Size:** 6.0" (15 cm) H x 8.5" (21.3 cm) W. **Character Type:** 8 x 10 character cell. **Character Size:** approx. 0.2" (5 mm) H x 0.1" (2.5 mm) W. **Character Set:** Normal: 128 characters; 95 ASCII, upper and lower case, numerics and punctuation, 33 graphic characters. Alternate: 128 characters; 95 ASCII, superscript and subscript, scientific notation, and 33 graphic characters (VT-100). **Refresh Rate:** 60 Hz. **CURSOR: Type:** Underline or reverse (solid) video block. **Attributes:** On, off, blinking. **Addressing:** Direct or relative. **KEYBOARD: Unit:** Detached 91-key with 6 foot (1.9 m) coiled cord. **Layout:** 77-key QWERTY layout with programmable special function keys and 14-key numeric keypad. **Indicators:** Visible: POWER ON, KEYBRD LOCK, OFF LINE, and CAPS LOCK. Audible: Programmable key click with each key entry, power-on beep, bell sound on receipt of ASCII bell character. **COMMUNICATIONS: Mode:** Half or full duplex on the primary port, half duplex on the auxiliary port. **Code:** ASCII. **Format:** Serial asynchronous. **Word Length:** 7 data bits, one parity bit. **Stop Bits:** Two at 75 and 110 baud rates, one at all others. **Data Transmission Control:** Hardware and software (XON and XOFF) handshaking. **Parity:** Even, odd, mark, or space. **Power Requirements:** 90 – 132 VAC, 60 Hz. **DIMENSIONS: Video Unit:** 13.6" H x 12.9" W x 11" D (34.5 x 33 x 28 cm). **Keyboard:** 1.4" H x 18.3" W x 8" D (3.3 x 46.3 x 20.5 cm). **Weight:** Monitor: 18.9 lbs. (8.5 kg). Keyboard: 3.8 lbs. (1.7 kg).

2 Smart H-29 Terminal features performance

- **Built-in flexibility provides room to grow as your needs increase**

The most user-friendly kit terminal available, the H-29 allows a user to configure parameters from on-screen selections. All parameters are set through keyboard selections and stored in nonvolatile memory until reset. Even a user-setable 24-hour clock is accessible for keeping track of standard or elapsed time. A keyboard HELP key is also provided for prompts or help messages used with some software. And, a special screen saver automatically shuts off the display after 15 minutes of nonuse for those forgetful moments. In addition, built-in power-up diagnostics ensure proper operation of the terminal at all times.

The H-29 Terminal is compatible with many ANSI protocol terminals including the popular Heathkit H-19 Terminal. For greater versatility in education and business, the H-29 models the Lear-Siegler ADM3A and the Hazeltime 1500A Display Terminals. And, it is compatible with the DEC VT52 Terminal and has many

attributes of the DEC VT100 Terminal, all at a lower price than any of them.

Information is clearly displayed in 25 lines of 80 characters each on a nonglare green CRT in normal or reverse video. Select a block or underline and a blinking or nonblinking cursor. The detached keyboard of the H-29 has 91 keys and includes a separate numeric keypad. All keys are a nonglare type to provide nonslip finger contact and reduce eye-fatiguing glare. Four LED status indicators on the keyboard show power, off line, and keyboard and caps locked.

Along with a 128-character ASCII set, the H-29's keyboard can generate codes for an alternate character set of 33 special symbols in an 8 x 10 dot matrix. Besides lower and upper case letters, other characters include: superscript and subscript letters, Greek symbols, H/Z-19 graphics, VT-100 graphic and other symbols. Each entry is confirmed by an audible click and is automatically repeated when held down for over half a second, getting progressively faster as the key is held down.

Designed as an input/output device for a computer system, the H-29 Terminal can be hooked either directly or through telephone lines (using a modem) to any computer. It has two RS-232 standard connectors, a DTE type for computers or modems and a DCE type for an auxiliary device. An RS-232 serial cable is included for connecting the H-29 to computers and other peripherals.

Heathkit **Kit H-29,** Shpg. wt. 41 lbs. **449.00**

Zenith data systems **Z-29-A,** Z-29 with amber CRT, 45 lbs. ..... **Now Only 699.00**

Z-29-1, Palm Rest Accessory, Shpg. wt. 1 lb. **15.00**

Z-29-2, ROM Source Listing, Shpg. wt. 4 lbs. **25.00**

H/Z-29 SPECIFICATIONS: DISPLAY: CRT: 12" P31, green, non-glare video screen. **Display Format:** 25 rows of 80 characters. **Display Size:** 6" H x 8½" W. **Character Type:** 8 x 10 character cell. **Character Size:** 0.2" H x 0.1" W (approx.). **Video Attributes:** Normal or reverse character, normal or underline character, normal or half-intensity character, normal or blinking. Can be in any or all combinations. **Refresh Rate:** 60 Hz. or 50 Hz. **CURSOR: Type:** Underline or reverse (solid) video block. **Attributes:** On, off, blinking. **Controls:** Up, Down, Left, Right, Backspace, Tab, Back Tab, Back, Home, Carriage Return and Line Feed. **Addressing:** Direct and relative. **COMMUNICATIONS: Type:** EIA RS-232C. **Baud Rates:** 75 – 19,200 baud. **Mode:** Half or full duplex. **Code:** ASCII. **Format:** Serial asynchronous. **Word Length:** 7-data bits, one parity bit. **Stop Bits:** 2 at 75 and 110 baud rates, 1 at all other baud rates. **Sync:** Auto XON and XOFF. **Parity:** Even, odd, mark or space. **Power Requirements:** 105 – 127 VAC at 60 Hz and 45 watts.

3 A low-cost entry point data terminal

- **Instant and user-friendly access to all types of computers**
- **Plain English menu makes it easy to set up and use**

Information processing terminal: The HT-10 features an integral RS-232 standard port that can function at speeds from 110 to 9600 baud for communicating with personal, business and other computers. In addition, this versatile terminal is compatible with a DEC VT-52.

Plain talk: Built-in prompts and cues in simple English make it easy to communicate with and use this friendly terminal. Even those without typing skill or computer training will find the HT-10 easy to use. Programmed to be self-prompting, this terminal has an easy-to-follow display menu.

Easy-to-use keyboard: The keyboard features a standard 63-key layout including the full ASCII set with CTRL, ESC, BREAK, TAB and RETURN. Four cursor control keys and a special HELP key add further convenience.

Electronic typewriter: Connect a parallel-type printer to the rear Centronics interface and take advantage of the terminal's printing features.

Heathkit **Kit HT-10,** Terminal includes ZVM-121Z video monitor without modem, Shpg. wt. 36 lbs. **399.00**

Heathkit **Kit HTX-10,** Terminal less monitor and modem, 10 lbs. **279.00**

HT-10 SPECIFICATIONS: Character Set: 95 ASCII, 33 graphics. **Keyboard:** 63 keys (26 alphabet, 10 numeric, 4 cursor/special function, 12 control, 11 punctuation). **Cursor:** Blinking or steady block, or off. **Video:** RS170 compatible. **Printer:** Parallel (Centronics-type).

4 A rapid access terminal with internal modem

- **Single button accessing with universal log-on capability**
- **System setup allows automatic answering of incoming calls**

Telecomputing system: With its internal modem, the HT-1011 can be connected anywhere there is a modular phone jack to gain complete access to computer data services. After preprogramming in a menu of up to 26 pre-selected information sources, a user simply presses one button to automatically select a desired information source or place a normal voice call.

Memory capability: Besides dialing a desired source, the terminal can transmit all required codes. A special universal log-on feature allows the user to program in log-on procedures including account numbers, escape codes and passwords into a battery-protected memory system.

Included with some models is the ZVM-121Z monochrome monitor which features a green 12-inch CRT and excellent character definition.

Heathkit **Kit HT-1011,** Includes ZVM-121Z video display monitor, RS-232C port and 300 baud modem, Shpg. wt. 44 lbs. **449.00**

Zenith data systems **ZT-11-Z,** Assembled and tested HT-1011 with video display, RS-232C port and modem, Shpg. wt. 30 lbs. **579.00**

Zenith data systems **ZTX-11-Z,** Assembled and tested HT-1011 with modem RS-232C port less video display monitor, Shpg. wt. 6 lbs. ..... **Now 399.00**

Zenith data systems **ZT-1-UZ,** Assembled and tested Terminal with monitor and modem less RS-232C serial port, Shpg. wt. 30 lbs. **549.00**

Zenith data systems **ZTX-1-UZ,** Assembled and tested Terminal with modem less monitor and RS-232C serial port, 6 lbs. ..... **Now Only 349.00**

Accessories for the HT-10 and HT-1011 Terminals

ZT-1-2, Terminal Carrying Case, Shpg. wt. 2 lbs. **24.99**

ZTA-1-1, Parallel Cable, Shpg. wt. 1 lb. **25.00**

ZVM-121-Z, Optional Monochrome Video Display, for use with HTX and ZTX terminals. Features high resolution 12" green CRT that can display 25 line of 80 characters each, Shpg. wt. 18 lbs. **119.95**

HTX-10-1, Auto-dial/answer 300-baud modem, 1 lb. **69.95**

ZT-1-3, Universal ROM, one key access upgrade, 1 lb. **49.95**

5 Save $300 on a terminal with increased flexibility

- **14" non-glare CRT displays 25 rows of a selectable 80/132 characters**

The very friendly Z-49 Video Display Terminal is designed to satisfy all your business and personal needs while providing the greatest degree of user convenience. All Terminal functions, even screen brightness, are easily set up by programming selections through the keyboard as plain-English menus are displayed on-screen. These selections are then stored in non-volatile memory.

The Z-49 features an advanced 92-key keyboard that has: automatic key repeat, status indicators, user-defined function keys, and full cursor control keys. Other Terminal features include: a 14" Chromogold II™ (amber) screen; DTE and DCE connectors; H/Z-29, H/Z-19, DEC VT52 and VT100 compatibility; smooth scrolling; normal and alternate character sets; and more.

Zenith data systems **Z-49,** Assembled, 37 lbs. ..... **Was $1099.00 Now Only 799.00**

Z-49 SPECIFICATIONS: DISPLAY: CRT: 14" diagonal, enhanced contrast, video screen. **Display Format:** 25 rows of 80 characters or 25 rows of 132 characters. **Display Size:** 6.75" H x 9.25" W. **Character Type:** 80-column display, 10 x 12 character cell. 132-column display, 8 x 12 character cell. **Video Attributes:** Normal or reverse character, normal or underlined character, half intensity character and background normal or blinking display. **Refresh Rate:** 50 or 60 Hz. **CURSOR: Type:** Underline or reverse (solid) video block. **Attributes:** On, off, blinking. **Addressing:** Direct or relative. **COMMUNICATIONS: Type:** EIA RS-232C. **Baud Rates:** 50 – 19,200 baud. **Mode:** Half or full duplex. **Code:** ASCII. **Format:** Serial asynchronous. **Sync:** Auto XON and XOFF. **Power:** 105 – 127/210 – 254 VAC, 50/60 Hz, 73 watts.

6 Save $150 on an economical, user-friendly terminal

- **Compatible with Lear Siegler ADM11 and TeleVideo 914 Terminals**

Featuring parameter selection like the smart H-29 Terminal, the Z-22 also offers user programming of automatic logons to information services and programmable function keys. Ergonomic features include a low profile detachable keyboard with a 75-key standard QWERTY-type layout and an 18-key auxiliary keypad. The 12-inch monitor with green CRT tilts and rotates for comfortable viewing.

The easy-on-the-eyes CRT displays 25 rows of 80 characters, 24 rows of regular data plus a 25th status row which is user selectable between terminal status and defined through user selection. The Terminal displays a 96 character set including upper and lower case, numbers and punctuation. Three sets of graphics are also displayed which includes 33 graphics characters, 33 Zenith graphic characters and 33 foreign characters. The cursor can be set for blinking or nonblinking character, or blinking or nonblinking underline.

Also features compatibility with the popular Lear Siegler ADM11 and the TeleVideo 914 terminals which are found on many of today's systems.

Zenith data systems **Z-22,** Assembled, 37 lbs. ..... **Was $649.00 Now Only 499.00**

Z-22 SPECIFICATIONS: DISPLAY: CRT: 12" diagonal, green. **Display Format:** 25 rows x 80 characters. **Character Size:** 5 x 7 dot matrix with descenders. **Refresh Rate:** 60 Hz or 50 Hz. **CURSOR: Type:** Blinking or nonblinking block character or underline. **COMMUNICATIONS: Type:** EIA RS-232C. **Baud Rates:** 300-19,200 baud. **Format:** Serial Asynchronous. **Data Transmission Control:** Hardware and software (XON and XOFF) handshaking. **Power:** 120/220 VAC, 50/60 Hz. **DIMENSIONS: Monitor:** 13.6" H x 12.9" W x 11" D. **Keyboard:** 1.4" H x 18.3" W x 8" D. **WEIGHT: Monitor:** 18.9 lbs. **Keyboard:** 3.8 lbs.

The President's Letter

This issue of our catalog has some very special news for all of our Heathkit Master Builder Club members. The Club is two years old this spring and to celebrate we're expanding the program and adding bonuses and new incentives to help you to the rank of Master Builder. Details of the new rank and bonus levels are on page 53 of this catalog and will be available at your local Heath/Zenith Computers & Electronics Center in April.

To inaugurate the new levels we're giving 500 bonus points to any member who moves up a rank between April 1, 1986 and June 30, 1986. If you're not a member now, we'll give you the same 500 points just for joining the Master Builder Club during this time. So if you're not a member already, there's never been a better time to join the Master Builder Club.

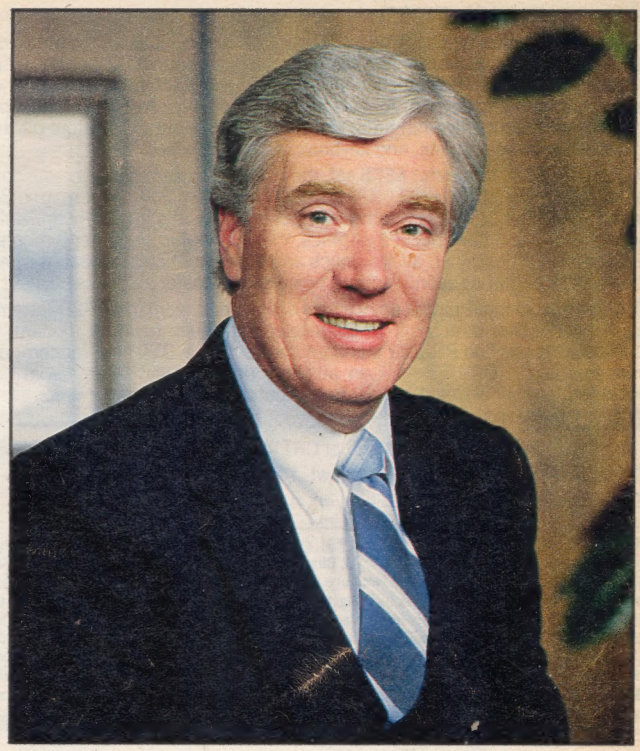
We've also got exciting news in this catalog on the new generation educational robot ...HERO® 2000. You'll meet HERO 2000 on the inside front cover along with two new courses on intelligent machines and robotics. HERO 2000 is clearly the most advanced robot of its kind on the market today.

On page 52, you'll find out about the expanded service and support available to you through your Heath/Zenith Computers & Electronics Centers from Micro Networking, to Communications and Auto CAD 3D. At Heath/Zenith we provide computer solutions.

Sincerely,

Joe Schulte

Joseph M. Schulte, President



The Heathkit Index

AMATEUR RADIO: packet radio interface, phone patch, CW novice receiver, high-tech transceivers, interfaces, amplifiers, CW keyboard, antenna tuners, accessories, courses 34-43

AUTOMOTIVE: ignition and engine analyzers, testers, siren/PA, wiper delay 28-29

CLOCKS: 20-21

COMPUTERS: IBM compatible, dual 16/8-bit, 8-bit, terminals, modems, printers, software, courses 80-103

EDUCATION: laser, drafting and applications software tutorials (80), robotics, introductory electronics, fundamentals of electricity and electronics, microprocessor and microcomputer technology, computer servicing, computer programming (82-83), amateur radio (42-43), engineering design, electro-optics, industrial arts, CAD graphics, video training and classroom courses 60-79

ENERGY: intelligent thermostat, heat sniffer, ... 30-31

GENERAL INFORMATION: 52-53

HOME PRODUCTS: phone line checker, 54; air cleaners, 30; home controller, 24-26; digital scale, 22; garage door opener, 32; lighting controls, 24, 26, 30; telephone equipment, 30; doorbells, 22.

INSTRUMENTS: phone line checker, handheld testers, generators, power supplies, frequency counters, digital and analog voltmeters, scope calibrators ..... 8 & 9, 44-57

MARINE: video fish recorder, fish spotters, digital and flashing depth sounders . 58 & 59

METAL LOCATOR: 22

NAME PLATE: solid brass engraving 56

NEW PRODUCTS: HERO 2000, and courses 2 & 3; Personal Instruments, 8 & 9; Wired EPROM Programmer, 56 & 57; Wired EPROM Eraser, 56 & 57; 19" Digital Color TV, 12; Kit HS-241 Advanced Personal Computer, 86; 20 MHz Dual Trace Oscilloscope, 44; HYPERACCESS communications software, 97; ZOOM modem, 98 & 99; SMARTHOME Control Unit, 26; Alarm Center, 27; Rain Gauge, 18; LC Bridge, 48; Byte Probe, 57; Satellite TV 10.

ORDERING INFORMATION: ..... 52 & 53

ROBOTICS: HERO 2000 and courses, 2 & 3; HERO 1 and courses, 62 & 63; HERO JR., 16.

SECURITY: home and business systems, alarms, telephone devices 24-28

STARTER KITS: 6

TELEPHONE: phone line checker (54), dialer, ringer, cordless 30

TV-VIDEO: color and B/W TVs, 5", 9", 13", 25", 45" screens, satellite TV, pocket TVs, VHS video cameras and recorders, video organizer, TV stereo adaptor 10-15

TOOLS: quality kitbuilding aids, lamps ... 32

WEATHER: computerized weather station, thermometer, humidity meter, barometer.. 18

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